A MANUAL OF DYEING

OF THE

CASSELLA COLOR COMPANY

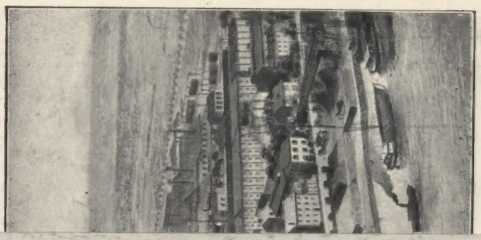
NEW YORK

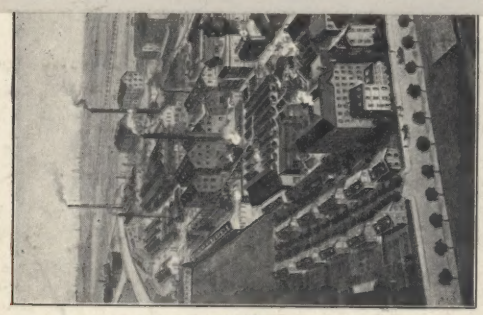
182 AND 184, FRONT STREET

III.

1. Garment Dyeing etc.
2. Feathers, Straw etc., Brushes and Upholstery Material, Human Hair, Flowers, Leaves and Grass, Artificial Flowers, Wood, Celluloid, Material for Button Manufacture.
3. Colour Lakes, Spirit Varnishes, Inks, Soap, Wax, Oil, Varnish, Leather Finishes.

Second, enlarged edition.





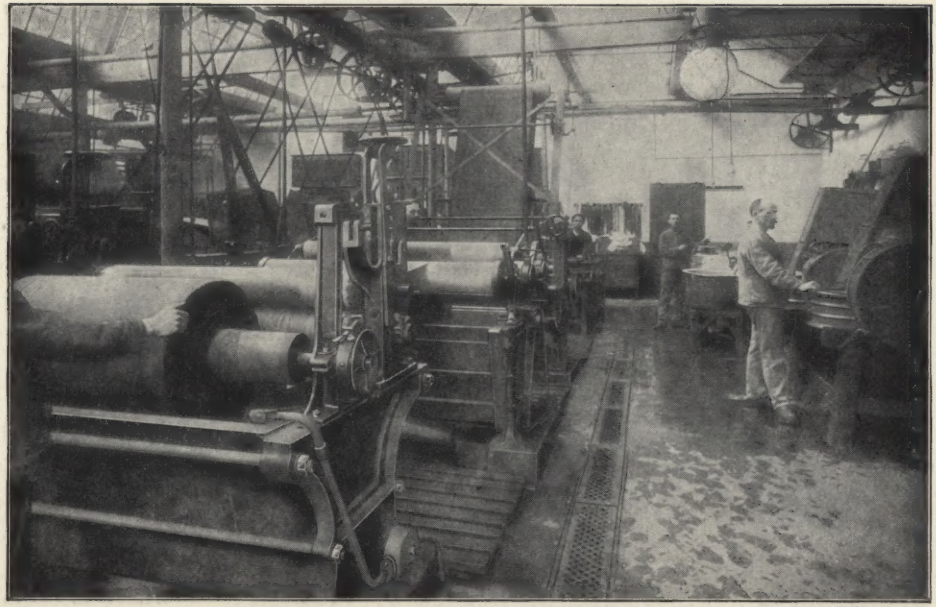
Experimental Dye-House

First Main Section: Dyeing on a Laboratory Scale.

Experimental Dye-House

Second Main Section: Dyeing on a Large (Practical) Scale.

Experimental Dye-House



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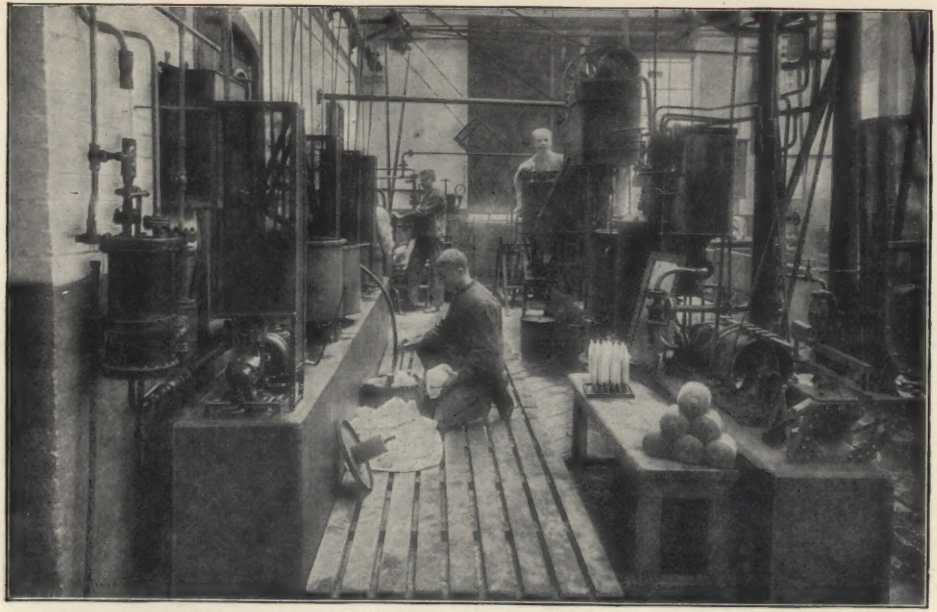
Experimental Dye-House



Fourth Main Section: Dyeing in Mechanical Apparatus.

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CASSELLA COLOR COMPANY, NEW YORK.

No 2940.

PREFACE.

Induced by the recognition shown for the previous editions of our

MANUAL OF DYEING

issued a few years ago, we have decided to bring out a new edition in an extended form.

The new edition is based on the same principles as the first, due attention being paid to improvements and new methods which have in the meantime been introduced.

We trust that this present Volume III will meet with a reception similar to that accorded to its predecessor, and that it will be equally appreciated.

NEW YORK, June 1914.

CASSELLA COLOR COMPANY.

On account of the liability of **Nitrazol C**, pat., to spontaneous combustion, we do not carry this article in stock. Wherever the use of same is mentioned in this hand-book, we recommend, instead, the use of diazotized **Paranitraniline**, for the coupling of our colors. The final result is exactly the same.

CASSELLA COLOR COMPANY.

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PART I.

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Dyeing of All-Wool Garments, Upholstery Goods, etc.
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" " Half-Silk Garments, Upholstery Goods, Ribbons, etc.
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GARMENT DYEING.

Goods to be treated by garment dyers differ from those dyed by piece dyers in that they have been in use already for a considerable time and have consequently undergone certain changes in parts through exposure to light and atmosphere. The action of light more particularly is in evidence when the articles of apparel, upholstery material, curtains etc. have been in use for some time, because it alters the original shade, causing the goods to fade, and also affects the properties of the fabric, in a certain sense effecting a chemical change.

With certain textile fibres, such as wool, the action of light is very considerable, the result usually being that the portions faded through exposure to light absorb dyestuffs much more readily than those which have not been exposed to its influence. As a rule, the original shade of the wool has nothing to do with the action of the light; if for instance the original shade is entirely removed, that is to say, stripped, the goods being then re-dyed to the original shade, the exposed parts will still show a contrast more or less, varying however with the dyestuff selected for the re-dyeing, and only in few cases will it be possible to cover the exposed portions perfectly. A very important factor is the selection of the dyestuffs, those dyestuffs being the best suited of all which have the property to cover evenly and well such unevennesses of the material as have been brought about in previous use, and to level easily, at the same time yielding shades as fast to

light and rubbing as possible. Dyestuffs of this kind have been taken in the first place into consideration in the lists given further on.

It is a matter of comparative indifference which of the various stripping methods is applied with a view to obtaining a satisfactory, level shade; the practice of stripping is however of great importance in garment dyeing, because it opens up very considerably the possibility of re-dyeing a certain ground colour to numerous other shades.

Garment dyeing generally commences with the cleaning of the article to be dyed and of stripping the ground shade if this should be found necessary. This is followed by the dyeing proper, the dyestuffs for this purpose being of course selected according to the nature of the material to be dyed. Such material is not as a rule uniform in character, and usually contains a great variety of textile fibres; a single article often contains wool, silk, cotton or even artificial silk, and has to be treated accordingly.

CLEANING AND STRIPPING OF DYED MATERIALS.

For cleaning and stripping dyed goods or such to be re-dyed, the following methods come into consideration.

A. CLEANING AND STRIPPING OF WOOL AND HALF-WOOL.

1. Stripping in Alkaline Baths.

Lukewarm baths of soda and ammonia are used, but must not be prepared too strong or too hot, in order to avoid any impairment of the wool; any spots of fat or oil paint present should previously be removed with soap, benzine, carbon tetrachloride, turpentine etc. After rinsing well, the goods are frequently boiled for a short time in plain water, to which some wheat bran may be added if desired. In some cases the goods are acidified in a hot bath with sulphuric or hydrochloric acid, being then rinsed well.

2. Stripping with Hyraldite pat.

Of the various Hyraldite brands, the following are chiefly used in garment dyeing for stripping dyed material:

Hyraldite Z for Stripping
Hyraldite Z soluble conc.

While *Hyraldite Z for Stripping* offers some advantage in price, *Hyraldite Z soluble conc.* is better soluble and requires less acid; it is principally used for tightly woven fabrics.

After first cleaning the goods with soda or ammonia, prepare a bath of 50° C. (120° F.), to which add

2—4% Hyraldite Z for Stripping and
3—6% formic acid 85% or
1—2% sulphuric acid 168° Tw.

} of the weight of the goods

raise the temperature to the boil, and treat for about ½ hour.

Hyraldite Z soluble conc. is applied as follows:

2—4% Hyraldite Z soluble conc.
1—2% formic acid 85%.

In addition to the two above-named brands, *Hyraldite C extra* and *A* are sometimes used, and likewise offer advantages, particularly for very thick cloths.

3— 5% Hyraldite C extra
5—10% acetic acid 30% or
bisulphite 64° Tw.

are used in the same way as Hyraldite Z; of Hyraldite A, twice as much is required as of Hyraldite C extra.

Hyraldite is best applied in clean wooden or earthenware vessels; metal steam pipes must be wrapped round with cotton cloth in order to prevent spots from forming. Particular care should be taken to rinse well.

3. Stripping with Nitric Acid.

The goods previously stripped with soda are treated in a boiling hot bath containing ½—¾ gallon nitric acid per 10 gallons, then rinsed thoroughly and neutralised with soda or ammonia. Instead of nitric acid, 4—6% sodium nitrite and 8—12% sulphuric acid may be used.

4. Stripping with Bichrome and Acid.

The goods stripped with soda are treated for ½ hour in a boiling hot bath with

2— 4% bichrome
5—10% sulphuric acid

and rinsed thoroughly.

B. STRIPPING OF COTTON, LINEN, JUTE AND CHINA-GRASS.

Boil the material for about one hour with about 8 oz soda ash or 4—6 oz caustic soda lye 77° Tw. per 10 gallons liquor, and treat with Hyraldite as indicated above, or bleach for several hours in a weak bath of chloride of lime (¾—1½° Tw.); then rinse thoroughly, and acidify with hydrochloric acid and the addition of a little bisulphite.

Linen, jute and China-grass are treated in the same manner. In the case of jute it is not necessary to boil off, a treatment in a boiling hot soda bath being sufficient.

C. STRIPPING OF SILK, HALF-SILK, WOOL AND SILK MIXED GOODS AND ARTIFICIAL SILK.

Silk and half-silk are best cleaned in a boiling hot soap bath, the greater part of the ground colour being thereby stripped in most cases.

Goods of wool and silk or artificial silk are treated in a weak soap bath of only 40—50° C. (105—120° F.) with the addition of a little ammonia.

If by this treatment the goods are not decolourised sufficiently, they may subsequently be subjected to a treatment with Hyraldite, according to the directions above given.

DYEING OF ALL-WOOL GARMENTS, UPHOLSTERY GOODS ETC.

a) Ladies' light dress materials, upholstery cloths etc. which are to be re-dyed to the original or a different shade are dyed after previous cleaning with soda or suitable stripping *in strongly acid baths* with the dyestuffs indicated further on. Any cotton or artificial silk contained in the article remain undyed or become stripped during the process and have to be dyed subsequently; silk in the shape of trimmings or sewing threads mostly remains somewhat lighter in shade than the wool.

b) Gentlemen's clothes or other goods which are cleaned but slightly, the cotton seams, linings and silk facings etc. of which are to retain their shade as much as possible, are dyed *in feebly acid baths.*

c) Very bright shades on pure white wool goods or on goods requiring only light re-dipping and which should not be severely boiled, are dyed with Basic Colours *in neutral baths.* Silk is thereby dyed the same depth of shade, cotton remaining practically unstained.

A. DYEING IN STRONGLY ACID BATHS.

The dyestuffs mentioned below and marked with an asterisk (*) are distinguished by their good levelling properties and are thus suited in the first place for shading and for dyeing mode shades; those marked with a cross (†) possess exceedingly good fastness to light, which is specially desirable when dyeing light shades and goods for upholstery, curtains etc. The fastness to rubbing, water and hot pressing of the dyestuffs mentioned is sufficient for normal requirements in most cases.

Rose and Salmon Shades:

Bright pink shades are preferably dyed with

*Rosazeïne B, 13;

for shading towards yellow,

*Acid Yellow AT
†*Fast Acid Yellow TL, 3G
*Orange GG†, extra

are used.

Duller shades of pink, so-called salmon shades, are dyed with

†*Brilliant Lanafuchsine GG, SL, BB
*Lanafuchsine SG, SB.

The afore mentioned products may be used for shading.

Scarlet, Red and Claret:

For bright shades:

†Brilliant Scarlet } all brands
†Brilliant Croceïne }
Crystal Scarlet 6R
†Brilliant Cochineal 2R, 4R.

For deep and more bluish Reds:

†*Brilliant Lanafuchsine GG, SL, BB
*Lanafuchsine SG, SB, 6B
Naphtol Red C, EB
*Azo Orseille BB
Azo Rubine A, BB
*Acid Magenta.

Claret and Red Brown

are obtained by using the brands mentioned for the production of red shades and by saddening with

*Cyanole extra
*Tetra Cyanole V
*Cyanole Green B, 6G
†*Cyanole Fast Green G

†*Alizarine Cyanole EF
*Acid Violet 6BS
†*Alizarine Cyanole Violet R
*Azo Wool Violet 4B, 7R,

the following being used for shading:

*Orange extra, GG†
*Acid Yellow AT
†*Fast Yellow S.

Light Blue, Blue and Peacock Blue:

Very bright greenish Blues may be produced with

*Cyanole FF, extra, BB
*Tetra Cyanole extra, V, A.

For medium shades the afore-mentioned brands are suited, as well as

†*Alizarine Cyanole EF, B, SR, SB
*Indigo Blue N, SGN
*Cyanole Navy Blue KR.

For fuller and more reddish shades the above mentioned brands may be saddened with

*Acid Violet 6BS, 4RS.

For light and medium shades of Blue the various brands

*Alkaline Blue R—6B

are used in many instances.

Navies and Deep Blues:

There being a large number now of well covering wool dyestuffs to chose from, which, when applied as self colours, yield good navy blue shades, it is now unnecessary any longer to employ combinations of blue and green acid dyestuffs with violet and red ones. The following are specially to be recommended:

*Azo Wool Blue B, SE, SER, 6B
*Acid Navy Blue A
*Azo Navy Blue B, 3B
*Brilliant Naphtol Blue 4B, B, R
*Azo Fast Blue B, BD
Fast Navy Blue B, G.

For saddening are used:

*Orange extra, GG†
*Lanafuchsine SB, SG.

Yellow and Orange:

*Naphtol Yellow S
*Acid Yellow AT
†*Fast Acid Yellow TL, 3G
} for bright greenish yellows

*Fast Yellow S
*Indian Yellow G, R, FF
*Tropaeoline O, OO
} for reddish yellows

*Orange GG†, extra, R.

Green and Dark Green:

Bright Greens are obtained with

*Acid Green extra conc., extra conc. B, 5G
†*Cyanole Fast Green G
*Fast Acid Green BN
*Cyanole Green B, 6G, S.

For saddening the following are used:

*Azo Wool Blue SE, SER, 6B
*Azo Fast Blue B, BD
*Orange extra
*Lanafuchsine SG
*Azo Wool Violet 4B;

and for shading towards yellow:

*Fast Yellow S
*Acid Yellow AT
†*Fast Acid Yellow TL.

Grey and Mode Shades

are produced with combinations of

*Cyanole Green B, 6G
*Cyanole extra
†*Alizarine Cyanole EF
*Tetra Cyanole V, with
*Acid Yellow AT
†*Orange GG
†*Brilliant Lanafuchsine BB, GG
*Lanafuchsine SG, SB, or
*Azo Orseille BB for very light shades.

For Brown and Olive

the following are very well suited:

*Acid Brown 74565J
*Wool Brown KR, 42901J, 44191J
*Wool Olive KG, KGO,

or combinations of:

*Cyanole Green B, 6G or
†*Cyanole Fast Green G with
*Lanafuchsine SG, SB
*Fast Yellow S
*Indian Yellow G
*Orange extra, GG†.

Violet and Prune Shades.

For bright shades:

*Acid Violet 6BS, 6BC, 4RS
Formyl Violet, all brands;

for darker shades:

*Azo Wool Violet 4B, 7R
†*Alizarine Cyanole Violet R
†*Azo Fast Violet 2R;

for shading and saddening:

*Cyanole Green B, 6G
*Cyanole extra;

for more reddish shades:

*Lanafuchsine SB, SG
*Acid Magenta
*Orange extra.

Blacks:

For Deep Blacks:

Naphtol Black B, BB, 3B, 6B, SG
Naphtylamine Black S, T, TJ, ESN, SGG;

for Blue-Blacks:

Naphtylamine Blue Black B, 5B
Naphtol Blue Black
*Azo Merino Black B, 6B, BE, 6BE, 3BN.

For saddening:

*Indian Yellow G, R;

for shading:

*Acid Green extra conc.
Formyl Violet S4B.

Directions for Dyeing in Strongly Acid Baths.

All the dyestuffs indicated are dyed with the addition of 10—20 % Glauber's salt crystals and 3—5% sulphuric acid or 10—15% bisulphate of soda. An excess of acid or bisulphate of soda does not act favourably, but causes the dyestuffs to rush on to the fibre, thus impeding good levelling; this is noticeable especially with very thick cloths which are difficult to dye through. Such an excess is moreover detrimental to cotton or artificial silk contained in the goods. In order to ensure a gradual absorption of the dyestuffs, acetic or formic acid are sometimes used in place of sulphuric acid, a little of the latter being added only when the bath is nearly exhausted in order to complete the exhaustion. An increase too in the quantity of Glauber's salt is sometimes advisable.

The goods as a rule are entered into the dyebath at 60—70° C. (140—160° F.), the temperature being gradually raised to the boil. Boiling is then continued for one hour, whereupon the goods are rinsed in cold water. The dyebaths are in most cases completely exhausted so that they need not be preserved for further use.

The *Alkaline Blues* are dyed at 80—90° C. (175—195° F.) with the addition of 1—2 % soda crystals or 4—5% borax, the goods being thereupon rinsed and brightened hot with sulphuric acid.

In view of the fact that cotton and artificial silk are not stained by most of the above-mentioned dyestuffs, and that silk in most cases remains lighter than the wool, it may be necessary, unless undyed effects are desired in goods specially suited for the purpose, to subsequently dye the cotton or artificial silk as described on page 20; or silk in a lukewarm bath feebly acidulated with sulphuric acid as stated on page 56.

B. DYEING IN FEEBLY ACID BATHS.

The dyestuffs applied for this purpose have the tendency to go on to the fibre in a bath acidified but mildly with organic acids such as formic acid or acetic acid, or sometimes with the addition of salts only, whereby the wool is chiefly dyed, the cotton or silk usually retaining their colour. They do not level quite as well as the colouring matters dyed in strongly acid baths, and are thus less suited for producing light shades, but more for dark ones, particularly for gentlemen's clothing and upholstery materials, on which they yield shades of particularly good fastness to light. Lighter shades may however likewise be dyed on materials which are not too badly faded.

The following dyestuffs are used:

Red and Claret:

For bright reds:

Diamine Scarlet B, 3B;

for full red shades and clarets:

Diamine Fast Red F, 8BL
Diamine Bordeaux S
Diamine Fast Bordeaux 6BS;

for saddening:

Formyl Violet S4B.

Yellow and Orange:

For bright shades of Yellow:

Diamine Yellow CP
Milling Yellow O.

Orange:

Diamine Orange B, F
Orange extra.

Navy and Deep Blue:

Here the Alphanol Blue brands come chiefly into consideration, of which

Alphanol Blue GN, BR extra are used for greenish blues, and
Alphanol Blue 5RN for reddish blues.

The following also are suitable:

Lanacyl Blue BN, RN, BB, R
Lanacyl Navy Blue B, BB.

For shading are used:

Formyl Blue B
Brilliant Milling Blue B, FF, FG
Formyl Violet S4B, 6B, 10B
Lanacyl Violet B, BF
Brilliant Milling Green B.

Dark Green and Olive:

For dark green:

Diamine Green B, G
Diamine Dark Green N;

for shading:

Brilliant Milling Green B
Indian Yellow G, FF
Diamine Yellow CP.

Olives are obtained in the same way, being shaded with

Orange extra
Diamine Brown 3G
Oxy Diamine Brown G;

For saddening is used:

Naphtol Blue Black.

Brown:

Deep and well covered shades of Brown are obtained with

Alphanol Brown B,

bright and more reddish shades with

Diamine Brown M, R,

light and more yellowish Browns with

Diamine Brown 3G
Oxy Diamine Brown G
Diamineral Brown G;

for shading:

Indian Yellow G, R
Orange extra
Tropaeoline G, OO;

for saddening:

Naphtol Blue Black
Alphanol Black B, BG.

Violet:

Formyl Violet S4B, 4BF, 6B, 10B
are particularly well suited.

Black:

The following are used extensively in the first place:

Naphtylamine Black 4B, 6B, X2B, X3B
Alphanol Black B, BG, 3B, R
Naphtyl Blue Black N;

for shading:

Indian Yellow G, R
Formyl Blue B
Formyl Violet S4B
Brilliant Milling Green B.

Directions for Dyeing in Feebly Acid Baths.

Dye with the addition of 10—20% Glauber's salt crystals and 3—5% acetic acid for one hour at the simmer. In the case of the Alphanol Blue brands and Diamine Colours it is more advantageous to substitute for acetic acid an equal amount of acetate of ammonia, adding a little acetic acid only when the bath does not become fully exhausted. For Blacks the amount of acetic acid may be increased to about 10% if the baths do not exhaust sufficiently; 20 parts

formic acid (85%) may be used in the place of 100 parts acetic acid (30%).

Care has to be taken that the dyebaths always react feebly acid, i. e. that the goods to be dyed do not contain any alkali from a previous washing. It is advisable, especially in the case of gentlemen's clothes, to avoid an alkaline washing; any spots present should before the dyeing be removed with benzine etc. or with a neutral soap solution, the goods being only wetted well in hot water.

If cotton or artificial silk do not appear to be dyed sufficiently well by the process described, they may be subsequently treated in accordance with the details on page 20. Silk may be dyed subsequently in a lukewarm bath feebly acidulated as stated on page 56.

C. DYEING WITH BASIC COLOURS.

Basic Colours are used on light and pure white wool goods for the quick production of bright shades of crimson, violet, green and yellow.

The following Basic Colours find application for the purpose.

Rose, Crimson and Deep Red:

Irisamine G
Magenta, all brands
Cerise Ia., N
Russian Red B, G
Aniline Brown.

Yellow, Orange and Brown:

Thioflavine T, TCN
Chrysoïdine, all brands.
Bismarck Brown, all brands.

Green:

Brilliant Green Crystals extra
Solid Green Crystals O;

for shading:
Thioflavine T, TCN.

Blue:

Victoria Blue B
Indazine M.

Violet:

Methyl Violet, all brands
Crystal Violet 5B bluish, 10B.

Directions for Dyeing with Basic Colours.

Basic Colours are best dyed with the addition of 10% Glauber's salt crystals and 2—3% acetic acid; enter the goods warm, raise to the boil, and then cool off again as far as possible. For Chrysoïdine and Bismarck Brown it is advisable to add 5% alum, for Thioflavine 5% acetic acid, or for specially bright shades 10% bisulphite of soda.

Brilliant Green and Solid Green are either dyed with 10% Glauber's salt and 5% acetic acid or on a previous mordant of hyposulphite of soda, 10% alum and 5% sulphuric acid. Mix this mordant in a wooden vessel, and treat the goods for 1 hour at 70—80° C. (160—175° F.) in the liquor, which assumes a milky appearance, then rinse well, adding to the last rinsing bath about 3 oz ammonia per 10 gallons, finally dyeing at about 80° C. (175° F.) in an acetic acid bath.

Victoria Blue is best dyed with 10% Glauber's salt and 10% bisulphate of soda or 4% sulphuric acid; enter the goods at 50° C. (120° F.), slowly raise the temperature to the boil, and boil for about 1 hour.

If the cotton should not have assumed a sufficiently deep shade, it may be brought to shade by working according to the directions on page 20.

DYEING OF HALF-WOOL GARMENTS, UPHOLSTERY GOODS ETC.

The above heading is intended to embrace not only goods woven from wool and cotton, but also garments etc. composed mainly of wool containing cotton or silk in the form of linings, sewing threads etc.

Varying with the character of the goods, the following methods of dyeing may be employed:

a) Dyeing the wool first in an acid bath and the cotton subsequently with Diamine or Basic Colours.

b) Dyeing the cotton first with Diamine Colours and wool-dyeing in an acid bath.

c) Dyeing with Diamine and Union Colours in neutral baths by the one-bath method.

d) Dyeing in feebly acid baths by the one-bath method.

e) Dyeing with Duatol Colours by the one-bath method.

A. DYEING THE WOOL FIRST IN AN ACID BATH AND THE COTTON SUBSEQUENTLY WITH DIAMINE OR BASIC COLOURS.

This process is the most resorted to and the simplest in its application, because as a rule it permits of using the dyebaths which have already served for wool-dyeing.

For acid-dyeing the wool, any of the dyestuffs enumerated on page 7 to 14 may be used according to the directions stated there. The cotton is thereby not stained at all or only slightly so.

The subsequent dyeing of the cotton was formerly carried out in a cumbersome manner as a rule by first mordanting with sumac and iron or antimony salts and then dyeing with Basic Colours. In this way it was difficult to ensure exactly uniform results on wool and cotton, and furthermore the dyed shades always showed the serious defect of rubbing, which could only with great difficulty be overcome. This process is therefore now only resorted to in exceptional cases and preferably for the production of very bright pure shades.

The subsequent dyeing of the cotton with Diamine Colours is a much simpler process, because these dyestuffs cover the cotton very well, but hardly stain the wool and hardly smut in the least. The following are the products principally used for

Rose, Red and Claret:

Diamine Rose BD, GD, FFB
Diamine Fast Scarlet 4BFF
Diamine Purpurine 6B
Diamine Red 10B
Diamine Violet Red
Diamine Fast Red 8BL
Diamine Brilliant Bordeaux R
Diamine Fast Bordeaux 6BS.

Light Blue, Blue and Dark Blue:

Diamine Sky Blue, FF
Diamine Fast Blue FFB
Diamine Blue 2B, 3B
Diamine Brilliant Blue G
Oxydiamine Blue PG, PB, PR
Diamine Black BH, BHF, BHS conc., HW.

Yellow and Orange:

Oxydiamine Yellow TZ
Diamine Fast Yellow A, AR, AGG
Diamine Orange G, D
Diamine Fast Orange ER.

Green and Dark Green:

Diamine Green G, HS
or a combination of
Diamine Fast Yellow AGG or A and
Diamine Sky Blue, saddened with
Diamine Black HW or BH.

Brown:

Diamine Nitrazol Brown G
Diamine Fast Brown G, R, GB
Diamine Brown M, S
Oxydiamine Brown RN.

Violet and Prune:

Diamine Heliotrope G, B, O
Oxydiamine Violet B, BF, G, R
Diamine Brilliant Violet B, RR
Diamine Fast Violet BBN.

Black:

Diamine Black RMW
Diamine Black 2606J
Diamine Fast Black X.

Directions for Dyeing the Cotton subsequently with Diamine Colours.

The acid-dyed goods which in the wool have been kept rather lighter than the shade desired are rinsed well, so as to remove all traces of acid, hydroextracted and then treated for ½ to 1 hour at 30—40° C. (85—105° F.) in as short a liquor as possible, containing besides the required dyestuff 1—2 lbs Glauber's salt crystals and $^3/_8$ to $^3/_4$ oz soda ash or ammonia; they are then hydroextracted or allowed to drain well and rinsed in cold water, finally with the addition of some acetic acid. The dyebaths are not exhausted, and it is advisable therefore to keep them for further use.

If the shades obtained should not be bright enough in some instance or other, they can easily be brightened in a fresh cold bath with slight quantities of Basic Colours and the addition of some acetic acid.

Directions for Dyeing the Cotton subsequently with Basic Colours.

For specially bright shades of blue, green, violet and crimson — more rarely for deep shades — the cotton is mordanted with tannin and antimony and then dyed with Basic Colours. The products best suited for this purpose and the method of dyeing are mentioned on pages 87 and 88. For the mordanting and dyeing, the baths should be cold or in any case not warmer than 40° C. (105° F.) to prevent the wool from absorbing too much dyestuff.

B. DYEING THE COTTON FIRST WITH DIAMINE COLOURS AND ACID CROSS-DYEING THE WOOL.

A number of the Diamine Colours possess the remarkable property when dyed on half-wool goods to resist the subsequent acid dyeing of the wool if a suitable method of dyeing is followed; it is thus possible by bottoming with Diamine Colours and subsequently dyeing in an acid bath to produce

uniform shades on half-wool; the way of working (described sub A) is thus reversed. For this purpose the dyestuffs mentioned below are especially well suited, partly dyed direct and partly dyed according to the diazotising or coupling process.

This method of working is very useful because it allows of producing very full and relatively fast shades on the cotton, imparts a good handle to the goods, and makes shading during the subsequent acid-dyeing of the wool an easy operation.

The following are suited for *direct dyeing:*

For Yellow and Orange:

Diamine Fast Yellow A, AGG
Diamine Orange G, D.

Red:

Diamine Fast Scarlet GFF, 4BFF, 5BFF, 7BFF, 8BF, 10BF
Diamine Brilliant Rubine S.

Blue:

Diamine Sky Blue FF
Diamine Fast Blue FFB, FFG
Diamineral Blue R.

Brown:

Diamine Catechine G, B
Oxydiamine Brown RN, 3GN
Diamine Brown S.

Black:

Oxydiamine Black UI extra conc.
Paradiamine Black BB extra conc., BF extra conc.
Diamine Milling Black FG extra.

The following may be used by the *diazotising* or the *coupling process*, both of which methods yield shades still superior in fastness to acid boiling:

For Red and Claret:

Diamine Azo Scarlet 4B, 8B, 2BL extra, 4BL extra, 6BL extra, 8B extra
Diamine Azo Bordeaux B
} developed with Beta Naphtol.

Blue:

Diaminogene Blue NB
Diamineral Blue CVB, 3RC
Diamine Azo Blue R, RR
Oxydiamine Violet BF
} developed with Beta Naphtol.

Olive and Dark Green:

Diamine Nitrazol Green GF, BB. coupled with Nitrazol CF or Paranitraniline C.

Brown:

Diamine Nitrazol Brown G, T, RD, BD
Diamine Brown S
Oxydiamine Brown RN
} coupled with Nitrazol CF or Paranitraniline C.

Black:

Diamine Black BH, BHF, BHS conc.
Diaminogene B
} for deep black developed with Phenylene Diamine and for Blue-black with Beta Naphtol.

Diamine Nitrazol Black B, BB. coupled with Nitrazol CF or Paranitraniline C.

Directions for Dyeing first with Diamine Colours and Acid Cross-Dyeing the Wool.

Dyeing the Cotton:

The Diamine Colours referred to on pages 21 and 22 are best dyed for 1 hour in a bath of 70—80° C. (160—175° F.) with the addition of 2 lbs Glauber's salt crystals and ¾—1½ oz soda ash per 10 gallons

liquor. The goods are then lifted, allowed to drain off well or hydroextracted, and rinsed cold.

Diazotising and Developing.

The diazotising and developing is carried out as follows:

The rinsed goods are treated for 15 to 20 minutes in a cold bath with

3% nitrite and
9% hydrochloric acid or
6% sulphuric acid;

hereafter rinsed cold and developed for 15 minutes in a fresh cold bath:

Black with

0.7% Phenylene Diamine Powder, dissolved with half its weight of soda ash

Dark Blue, Red and Claret with

1 % Beta Naphtol, dissolved with the same quantity of caustic soda lye 77° Tw.

Coupling with Nitrazol CF or Paranitraniline C.

The coupling (for Brown, Green, Olive and Black) is carried out by working the dyed and rinsed goods in a short, cold bath with the addition of Nitrazol CF or of diazotised Paranitraniline C, soda and acetate of soda for 10 to 15 minutes, and then rinsing thoroughly.

a) Coupling with Nitrazol CF.

For 100 lbs Goods:

3 —4 lbs Nitrazol CF
5 —6½ oz soda ash
1½—2 oz acetate of soda.

To dissolve the Nitrazol CF, it should be stirred up with a little cold water, any lumps being carefully crushed, and bringing it into complete solution by pouring a sufficient quantity of cold water over it.

b) Coupling with Paranitraniline C.

For 100 lbs Goods:

5—7 gallons diazotised Paranitraniline C
¾—1 lb soda ash
5—6½ oz acetate of soda.

Diazotised Paranitraniline:

Dissolve

2 lbs Paranitraniline C with
1½ gallons boiling condensed water, and add
½ gallon hydrochloric acid 32° Tw.; after some stirring, all will be dissolved; then add
3½ gallons cold water, which precipitates the hydrochloride of Paranitraniline in the form of a yellow paste.

This solution should always be prepared a few hours before use in order to cool down.

When quite cold, add
1 lb 1 oz nitrite of soda dissolved in
1 gallon cold water, agitating the mixture. After about 20 minutes, a clear solution results, which is then brought up to
20 gallons diazotised Paranitraniline C with cold water.

The diazo solution will keep for some time if preserved in wooden or earthen vessels and protected from heat or sunlight.

Dyeing the Wool subsequently in Acid Baths.

For this purpose most of the Acid Colours mentioned on pages 7 to 14 are suited, first of all those which are distinguished for levelling well. The following are specially to be considered:

Cyanole extra, FF, BB
Alizarine Cyanole EF, SR, SB
Tetra Cyanole V, extra
Azo Wool Blue SE, SER, B

Acid Navy Blue A
Alizarine Cyanole Violet R
Acid Violet 6BS, 4RS
Azo Wool Violet 7R, 4B
Cyanole Green B, 6G, S
Cyanole Fast Green G
Brilliant Lanafuchsine SL, GG, 2B
Lanafuchsine SG, SB, 6B
Azo Orseille BB
Orange extra, GG
Fast Yellow S
Acid Yellow AT
Fast Acid Yellow TL, 3G
Azo Merino Black B, 3BN, 6B, BE, 6BE
Naphtol Blue Black.

Goods which have been dyed direct with Diamine Colours are best acid-dyed with the addition of 10% acetic acid 30% (or 2—3% formic acid 85%) and 5% alum or 3—4% sulphate of alumina. Glauber's salt should be omitted.

When following this method of dyeing, the Diamine Colours dyed direct resist a gentle boiling in an acid bath without losing much in intensity. Their fastness to acid boiling is increased by adding during the cross-dyeing slight quantities of Basic Colours, which also increase the intensity of the shade of the cotton.

The following Basic Colours should be used:

New Methylene Blue N, GG
New Blue B, L
Brilliant Green Crystals extra
Thioflavine T
Bismarck Brown FF
Safranine S No 150
Magenta Ia. crystals.

When working with Basic Colours it is advisable to dye them cold or lukewarm with the addition of acetic or formic acid, and also of some alum or sulphate of alumina, and after they have been taken up by the fibre, to add the acid dyestuffs and then to boil gently on the whole for ¾ to 1 hour.

The diazotised and developed shades and such coupled with Nitrazol may be acid-dyed with Glauber's salt and sulphuric acid or bisulphate of soda in the ordinary manner without the addition of alum or sulphate of alumina, any of the acid dyestuffs mentioned on pages 7 to 11 being applicable.

C. ONE-BATH DYEING WITH DIAMINE COLOURS AND UNION COLOURS.

These dyestuffs are dyed by the one-bath method in a neutral bath, this process being principally resorted to for garments containing cotton in larger proportions and for which it is necessary that the wool and cotton are of a good uniform shade; it is preferred for the production of deep shades and black, but may with the same success likewise be used for producing light shades also on goods with a white or a light ground which are but slightly faded.

The following tables contain an enumeration of the dyestuffs specially suited, arranged according to their behaviour to the wool and cotton fibre, and include those wool dyestuffs suited for use in a neutral bath.

I. Diamine Colours and Union Colours dyeing wool and cotton the same or almost the same shade	II Diamine Colours dyeing the cotton more intensely than the wool	III. Wool Colours dyeing in a neutral bath
Yellow and Orange:		
Thioflavine S	Diamine Fast Yellow A, AGG, AR	Naphtaline Yellow Crystals
Oxydiamine Yellow GG, TZ	Diamine Orange G, D	Indian Yellow G, R, FF
Diamine Fast Yellow B, FF, M	Diamine Fast Orange EG, ER	Tropaeoline OO, G
Diamine Orange B, F		Orange extra, ENZ
Oxydiamine Orange G, R		Fast Acid Yellow 3G.
Union Fast Yellow G		
Union Fast Orange G, R		

I. Diamine Colours and Union Colours dyeing wool and cotton the same or almost the same shade	II. Diamine Colours dyeing the cotton more intensely than the wool	III. Wool Colours dyeing in a neutral bath

Pink, Red and Claret:

Diamine Rose BG, GD, BD, FFB	Direct Rose T	Irisamine G
Diamine Brilliant Scarlet S	Diamine Bordeaux B, BR	Rosazeïne 13, B
Diamine Red 4B, 5B, 6B, 10B, D	Diamine Fast Scarlet GFF, 4BFF, 5BFF, 7BFF, 8BF, 10BF	Azo Red A
Diamine Fast Red F, 8BL	Diamine Brilliant Rubine S	Croceïne AZ
Diamine Purpurine B, 3B, 6B		Roccelline
Diamine Bordeaux VRO		Wool Red B, BG
Diamine Brilliant Bordeaux R		Milling Red G
Union Fast Red R		Brilliant Milling Red R.
Union Fast Bordeaux FR		

Blue and Dark Blue:

Diamine Blue RW	Diamine Sky Blue, FF	Brilliant Milling Blue B, FF, FG
Diamine Bengal Blue G	Diamine Pure Blue A	Formyl Blue B
Diamine Steel Blue L, 2206J	Diamine Blue 2B, 3B, BG, NC, 3R, 53, 56	Tetra Cyanole A
Diaminogene B	Diamine Azo Blue 51, 54	Thiocarmine R
Union Blue FN, BB, BJ, RJ, K3B, 761J, 806J, 2570J, 2472J, 4036J, 4083J	Diamine New Blue R, G	Alizarine Cyanole B
Union Navy Blue 780J	Diamineral Blue R, B, BF, 3B, CV, 3RC	Naphtol Blue G, R
Union Fast Blue F, FR, F3R	Diamine Brilliant Blue G	Lanacyl Blue BB, R, BN, RN
Union Fast Dark Blue B, R, OHDF	Oxydiamine Blue 5G, 3G, G, B, R, PG, PB, PR	Lanacyl Navy Blue B, BB
	Diamine Fast Blue BN, G, FFG, FFB	Alphanol Blue BR extra, GN, 5RN
	Diamine Bengal Blue R	Alkaline Blue 3R—6B
	Diamine Dark Blue B	
	Diamine Black BH, BHF	

I. Diamine Colours and Union Colours dyeing wool and cotton the same or almost the same shade	II. Diamine Colours dyeing the cotton more intensely than the wool	III. Wool Colours dyeing in a neutral bath

Green and Dark Green:

Diamine Green B, G, CL, FG, 2209J, 2210J	Diamine Green HS, or combinations of	Brilliant Milling Green B
Diamine Dark Green N	Diamine Sky Blue FF	Naphtol Dark Green G
Diamine Nitrazol Green S	Diamine Fast Yellow A, AGG	Alizarine Brilliant Green G.
Union Green 2341J, 3640J, 3446J, 4419J, 4481J		
Union Fast Green GG, BB		

Violet:

Diamine Violet 2204J, 2205J	Diamine Violet N, BB	Formyl Violet S4B, 4BF, 6B, 10B, HW
Union Fast Heliotrope B	Diamine Heliotrope G, B, O	Alkaline Violet CA, C
	Oxydiamine Violet B, R, G, BF	Lanacyl Violet B
		Alizarine Cyanole Violet R.

Brown:

Diamine Brown M, MR, S, R, B, GWA, BWA, 3G, 30a, 33, 37, 40, 42a, 43, 44	Diamine Catechine B	Alphanol Brown B.
Diamineral Brown G	Diamine Nitrazol Brown G	
Oxydiamine Brown G, 3GN	Oxydiamine Brown RN	
Diamine Catechine 3G, G	Diamine Fast Brown G, R, GB	
Union Brown TD, 1926J, 2089J, 2571J, 3493J, 4221J, 4354J	Diamine Brown ATC	
Union Dark Brown A		
Union Fast Brown R, RD, G		

DYEING OF HALF-WOOL GARMENTS, UPHOLSTERY GOODS ETC.

I. Diamine Colours and Union Colours dyeing wool and cotton the same or almost the same shade	II. Diamine Colours dyeing the cotton more intensely than the wool	III. Wool Colours dyeing in a neutral bath
Grey and Black:		
Direct Grey 2207J	Oxydiamine Black BM, A, D, SA, US	Naphtylamine Black D, 4B, 6B, X2B, X3B
Union Fast Grey G, BR	Paradiamine Black B, BB, FFB, BF extra conc., FF extra conc.	Naphtyl Blue Black N, FBB
Union Jet Black B, GB	Diamine Fast Black F, X, XN extra conc., C high conc., CB high conc.	Neutral Wool Black G, B, 4B
Union Fast Black J, SB	Diamine Black RMW	Alphanol Black BG, R, 3BN
Union Black S, P, BG, BB, 3B, KD, OJGJ	Garment Black KP	Naphtol Blue Black.
Oxydiamine Black SOOO, FFC, JEI, JB, JW, JWF		
Diamine Black HW, DB		

The following Diamine Colours are specially to be mentioned as working more on to the wool than to the cotton: Diamine Scarlet B, 3B, Diamine Violet Red, Diamine Bordeaux S, Diamine Fast Bordeaux 6BS, Diamine Yellow CP, Diaminogene extra and Cotton Brown N.

Directions for Dyeing Diamine Colours and Union Colours by the One-Bath Method.

Dye in a neutral bath, containing for light shades 1 lb, for medium and dark shades 2—4 lbs Glauber's salt crystals per 10 gallons liquor. The goods, if previously cleaned, must not retain any soda or ammonia, because these substances in a neutral hot bath impair the wool and unfavourably affect the dyeing of the colouring matters. In many cases the goods are therefore gently soured off with acetic acid in order to remove any traces of alkali and then well rinsed again.

Dye near boiling temperature, or if necessary at the simmer. By prolonged boiling or at higher temperatures the wool is dyed more intensely, the cotton on the other hand more at a lower temperature. It is best to enter the goods lukewarm, then to raise the temperature to the boil, and to allow the bath to cool off again towards the end of the dyeing operation.

When Alkaline Blue is used, some borax or soda should be added to the dyebath and the shade be subsequently raised with acid; boiling is to be avoided.

After dyeing, the well cooled off goods are rinsed cold, because warm rinsing is apt to cause the colour coming off the cotton; some acetic acid should in every case be added to the last rinsing bath, or if desired to the finishing mass, in order to impart a better handle to the goods. If in some case or other specially bright shades are desired, topping with Basic Colours may be resorted to in a fresh cold or also hot bath with the addition of some acetic acid; the goods must however in such case be rinsed well before the topping.

When dyeing subsequent lots in standing baths, these have to be charged with about $^3/_4$ to $^4/_5$ths of the quantities of dyestuff used first and of Glauber's salt about $^1/_5$th. of the quantity for the starting bath.

D. ONE-BATH DYEING IN FEEBLY ACID BATHS.

The dyeing of half-wool in feebly acid baths by the one-bath method offers over the dyeing in neutral baths the advantage that the goods assume a better handle and that the formation of creases by boiling is avoided; this method also better preserves the lustre of certains kinds of goods, especially of those consisting of very hard wools, as for instance imitation astrachan and plush for upholstery and ladies' dresses.

The following should be used in feebly acid baths for

Yellow and Orange:

Thioflavine S
Oxydiamine Yellow TZ, CR
Diamine Fast Yellow A, AGG, B, FF, M, FR
Diamine Orange G, D, B
Diamine Fast Orange EG, ER
Union Fast Orange G, R.

Pink, Red and Claret:

Diamine Red 4B, 10B
Diamine Purpurine B, 3B, 6B
Diamine Rose GD, BD, FFB
Direct Rose T
Diamine Bordeaux B, S
Diamine Brilliant Bordeaux R
Diamine Fast Scarlet, all brands
Diamine Brilliant Rubine S
Union Fast Red R
Union Fast Bordeaux FR.

Blue and Dark Blue:

Diamine Sky Blue, all brands
Diamine Pure Blue A
Diamine Dark Blue B
Oxydiamine Blue 5G, 3G, G, B, PG, PB
Diamine New Blue G, R
Diamine Bengal Blue G, R
Diamine Blue 3B, NC
Diamine Brilliant Blue G
Diamineral Blue R, B, BF, 3B, CV, CVB
Diamine Fast Blue FFB, FFG, G, BN
Diamine Azo Blue R
Diamine Deep Blue B, R
Union Fast Blue F, FR, F3R.

Green:

Union Fast Green GG, BB.

Brown:

Diamine Brown 3G, M, MR, R, S, ATC
Diamine Fast Brown G, R
Diamine Bronze Brown PE
Diamine Catechine G, 3G
Union Fast Brown R, G, RD.

Violet:

Diamine Violet N
Oxydiamine Violet BF, B, R, G
Diamine Heliotrope G, B, O
Union Fast Heliotrope B.

Grey and Black:

Union Fast Grey G, BR
Diamine Fast Black F, X, XN extra conc., CB high conc., C high conc.
Diamine Azo Black B
Diamine Black BH, BHF, BHN, HW, DB, DN
Oxydiamine Black JE, JEI, JB, JW, JWF, SOOO
Paradiamine Black B, BB, FFB, FF extra conc., BF extra conc.
Oxydiaminogene FFN, FFG, ED, EF, OB, OT
Union Black KD, BB, 3B
Union Jet Black GB.

Directions for Dyeing in Feebly Acid Baths.

Dye with the addition of 2—4 lbs Glauber's salt crystals per 10 gallons liquor and 1—3% acetic acid 8° Tw. or 3—5% ammonium chloride, or sulphate of ammonia, (calculated on the weight of the goods); enter lukewarm, and raise slowly to boiling temperature, working for ½ to ¾ hour; if the wool should not then have assumed a sufficiently deep shade, boil for another ¼ to ½ hour; it is an advantage to allow the bath to cool off to some extent towards the end of the dyeing operation.

For shading the wool, the acid-dyeing wool colours enumerated on pages 26 to 28 (sub III) may be used.

E. DYEING WITH DUATOL COLOURS BY THE ONE-BATH METHOD.

The application of Duatol Colours yields the same advantages as ensured by the dyeing in feebly acid baths, but with the difference that Duatol Colours require no acid for dyeing, Glauber's salt alone being added.

The following Duatol Colours are on the market:

Duatol Yellow 2776J, 2816J, 2881J
Duatol Orange 2777J, 2780J
Duatol Scarlet G, K10B, 2882J
Duatol Red 2778J
Duatol Bordeaux B
Duatol Blue B, BD
Duatol Brilliant Blue R
Duatol Blue Green 2818J
Duatol Green 2779J
Duatol Brown R, B, 2817J
Duatol Grey 2819J
Duatol Black 3B, BT, KS, 2902J.

Dyeing Directions for Duatol Colours.

Dye in a short bath in the same way as with the Diamine Colours, adding 2—4 lbs Glauber's salt crystals per 10 gallons liquor and the dyestuff. Raise the temperature to the boil, shut off steam, enter the goods, work for ½ to ¾ hour without any further heating, and then boil for ½ to 1 hour as the case may require. Hereafter rinse, and sour off lightly with acetic acid.

An alternative method is the following: Enter the goods into the lukewarm bath, raise gradually to the boil, and boil until the wool is dyed to the desired depth of shade. Then rinse, and sour off lightly with acetic acid.

DYEING OF SILK GARMENTS, UPHOLSTERY GOODS, RIBBONS, ETC.

Silk articles are generally taken to pieces before they are dyed; they are less frequently dyed in the form of articles of apparel etc., and it is then usually a question of re-dyeing very soft materials such as foulard or crêpe. Better-class or heavier qualities are almost invariably unstitched before being re-dyed.

In view of its comparatively high value, the material has to be treated with particular care, special precautions being taken that it is not damaged through the formation of creases or abrasions during the dyeing. It is advisable in many cases to treat and dye the material "à ressort" i. e. on a frame, particularly in the case of heavy materials.

As already indicated, very weak hot soda or ammonia baths and strong boiling hot soap baths are employed for cleaning and stripping the goods to be dyed; soap baths of a concentration of 1—2 lbs soap per 10 gallons are generally employed.

Soap in itself has no injurious effect on pure silk, but in view of the fact that unreasonably weighted silk frequently has to be re-dyed which is apt to become tender during the treatment, it cannot be too strongly impressed upon dyers to test the articles to be dyed for their tensile strength before commencing work. This may be done by sharply bending a little piece of the material either with the finger nail or with a hot iron in the direction of both the warp and the weft of the fabric, and by then stretching and pulling the material; if it cracks at the sharply bent parts, care should be exercised in the dyeing. Such test may be carried out more effectively still with goods previously treated for some time in a boiling soap solution. Special attention should be

given to those parts of the material which have been much exposed to the light or to perspiration, these being the first to show any impairment.

If a treatment with boiling soap does not decolourise the goods sufficiently, the desired effect can usually be attained by a treatment with Hyraldite or with nitric acid as mentioned on pages 3—5.

Acid Colours are used principally for silk dyeing, but occasionally also Basic Colours; and for goods difficult to penetrate, and in the case of exacting demands for fastness to water and washing, Diamine Colours and Union Colours, as well as Duatol Colours, may to advantage be used.

A. DYEING IN ACID BATHS.

We recommend the following as being particularly well suited for the purpose:

Rose, Red and Claret:

For bright pink shades, the various Eosine Colours such as

Eosine GGF, 3G
Erythrosine B, D
Phloxine S
Rose Bengale extra N
Rosazeïne B, 13.

For bright Scarlets, the following are used principally:

Brilliant Croceïne R, B, 2B, M, 3B, 5B, 7B
Brilliant Cochineal 2R, 4R
Scarlet EC
Brilliant Scarlet GG, R, 3R, 4R
Crystal Scarlet 6R.

Shades of particular purity are moreover obtained with mixtures of

Rosazeïne B, 13 and
Orange extra.

For fuller and more bluish Reds:

Roccelline
Azo Rubine A
Azo Red A
Amaranth, B
Naphtol Red EB
Wool Red B
Bordeaux BL
Brilliant Croceïne 9B
Croceïne AZ
Lanafuchsine 6B
Brilliant Lanafuchsine SL.

For claret shades, the red dyestuffs last mentioned are used, shaded or saddened with Blue, Green, or Violet etc., the following brands being particularly well suited for this latter purpose:

Cyanole extra
Solid Blue R, 3R
Formyl Violet S4B
Cyanole Green B, 6G
Fast Acid Green BN.

Light Blue, Blue, Peacock Blue, Navy and Dark Blue:

For Light Blue and Blue, the following brands:

Cyanole extra, FF, BB
Tetra Cyanole A, V, extra
Alizarine Cyanole EF, B, SG, SB, SR
Methyl Blue for Silk
Pure Soluble Blue
Blue FS, BS, RS
Water Blue B, R
Formyl Blue B
Brilliant Milling Blue B, FF, FG
Indigo Blue N, SGN
Alkaline Blue 3R—6B.

For Peacock Blue, the same dyestuffs may be used, shaded if necessary with

Cyanole Green 6G
Fast Acid Green BN
Acid Green extra conc.
Orange GG
Indian Yellow FF.

For saddening:

Solid Blue R or
Naphtol Blue Black

should be used.

For Navies and Deep Blues,

Solid Blue R and 3R

are used, and may be saddened with

Orange extra
Croceïne AZ
Indian Yellow R
Naphtol Blue Black
Naphtylamine Black 4B or 6B.

For shading:

Water Blue B
Formyl Blue B
Formyl Violet S4B
Brilliant Milling Green B
Acid Green extra conc.

Frequently the goods are bottomed with

Alkaline Blue 3R—B,

and topped with

Solid Blue R or
Naphtol Blue Black.

Yellow and Orange:

Very pure yellow shades are obtained with

Naphtol Yellow S
Milling Yellow O, 5G
Acid Yellow AT
Fast Acid Yellow TL, 3G;

fuller and more reddish shades with

Indian Yellow FF, G, R
Tropaeoline G, OO.

For orange shades:

Orange extra, R, GG, EN

are used.

Green, Dark Green and Olive:

Light Green and Olive may be produced with

Acid Green extra conc., extra conc. B, 5G
Brilliant Milling Green B
Alizarine Brilliant Green G

shaded with

Naphtol Yellow S
Acid Yellow AT
Fast Acid Yellow TL, 3G
Indian Yellow FF, or
Orange extra.

For Dark Green:

Acid Green extra conc., extra conc. B, 5G
Fast Acid Green B, BN
Cyanole Fast Green G
Brilliant Milling Green B

saddened with

Solid Blue R
Naphtol Blue Black or
Naphtol Dark Green G

and shaded with

Indian Yellow G or
Acid Yellow AT.

Olive shades are produced with the same dyestuffs by adding

Orange extra
Acid Brown D.

Grey, Mode and Brown:

For grey and mode shades, the following may be used:

Nigrosine, soluble in water
Aniline Grey B, R
Silver Grey N
Induline B, 3B

and for shading:

Cyanole extra
Cyanole Green B

Brilliant Lanafuchsine BB
Lanafuchsine SG
Orange extra
Indian Yellow FF
Acid Yellow AT
Fast Acid Yellow TL, 3G.

Browns, in light shades, are obtained with

Acid Brown D

dark shades with

Alphanol Brown B;

for shading or saddening:

Indian Yellow G
Orange extra
Lanafuchsine SG
Roccelline
Solid Blue R, 3R
Cyanole extra
Naphtol Blue Black.

Violet and Prune:

For light and bright shades of Violet:

Formyl Violet S4B, 6B, 10B
Acid Violet 6BS, 6BC
Alizarine Cyanole Violet R
Alkaline Violet C.

Dark violet and prune shades are obtained with the same dyestuffs by saddening with

Solid Blue R, 3R
Cyanole Green B
Roccelline
Wool Red B

or direct with

Azo Fast Violet RR
Azo Wool Violet 7R
Lanacyl Violet BF.

Black:

The following are particularly well suited:

Naphtylamine Black 4B, 6B, D, X2B, X3B
Neutral Wool Black B, G
Silk Black DB
Alphanol Black R, BG, 3B, 3BN.

All of the products indicated may, for more bluish blacks, be shaded with

Acid Green extra conc.
Formyl Blue B;

for saddening,

Indian Yellow G
Orange extra

may be used, and

Naphtol Blue Black

for very greenish shades of black.

Directions for Dyeing in Acid Baths.

The acid colours mentioned are dyed at a temperature of from 70° C. (160° F.) to boiling heat in a weak sulphuric acid bath, with the exception of the Eosines, Neutral Wool Blacks and Alphanol Blacks, further Rosazeïne B, Milling Yellow, Alkaline Violet C, Alizarine Brilliant Green G, and Alphanol Brown B; these products should all be dyed with acetic acid or formic acid. An excess of acid should be avoided in the dyeing of silk goods particularly, because uneven shades are otherwise apt to result, such excess moreover preventing a good penetration which is essential for most goods; the baths should therefore react only very slightly acid. Dyebaths prepared with boiled-off liquor and acidulated with acid are very serviceable; the boiled-off liquor here has an effect similar to Glauber's salt in wool dyeing, viz. neutralising the acid, and acting exceedingly favourably on the quality of the goods by virtue of the fat and silk gum it contains, so that wherever practicable boiled-off liquor should be employed for the purpose. If boiled-off liquor is not available, a useful substitute may be prepared according to the following directions:

2 lbs soap, 6 oz glue or gelatine, 1½ oz monosolvol and 3 oz common salt are well boiled in 10 gallons of water. The solution is applied just like ordinary boiled-off liquor; the acidifying with acetic or sulphuric acid must take place very gradually and under constant stirring.

The penetration is moreover facilitated, particularly in the case of thick goods, by using small

quantities of Basic Colours along with the Acid Colours in the same bath.

Alkaline Blue is dyed in a boiling hot bath with the addition of 1% soda and 5% soap, the goods being then rinsed and brightened in a fresh bath of 60—70° C. (140—160° F.) acidified with sulphuric acid.

Tussah Silk ("Wild Silk") is dyed like ordinary silk, the same dyestuffs and methods of dyeing being applied; as however Tussah Silk does not absorb the dyestuff nearly so readily as ordinary silk, the dyebaths have to be charged with considerably larger quantities of dyestuff, the duration of the dyeing likewise being prolonged a little.

For Black on Tussah Silk, the following dyestuffs are particularly well suited:

Naphtylamine Black 4B, 6B, X2B, X3B
Neutral Wool Black B, G
Alphanol Black R, BG

and may as required be shaded with a little Indian Yellow R. Dye with 15—20% dyestuff in a boiling hot boiled-off liquor acidulated with acetic acid, which may be exhausted by adding a little sulphuric acid.

Tussah Silk is treated like real silk previous to the dyeing. Any bleaching which may be necessary if light shades have to be dyed may be carried out according, to the directions in the chapter on "Bleaching".

B. DYEING WITH DIAMINE AND UNION COLOURS.

Among the Diamine and Union Colours there are a number which may be applied to very good advantage in silk dyeing, these being used principally for the production of shades, requiring good fastness to water and washing, and in cases where good penetration is essential.

The following are to be recommended:

Pink, Red and Claret:

Diamine Rose GD, BD, FFB
Diamine Scarlet B, 3B
Diamine Fast Red F, 8BL

Diamine Fast Bordeaux 6BS
Diamine Bordeaux S
Diamine Brilliant Bordeaux R.

Blue and Dark Blue:

Diamine Sky Blue FF
Diamine Blue RW
Diamine Brilliant Blue G
Diamine Fast Blue FFB
Diamine Dark Blue B
Diamine Steel Blue L
Diamine Black BH
Union Blue BJ, RJ, 4083J
Union Fast Blue FR, F3R.

Yellow and Orange:

Diamine Fast Yellow FF
Diamine Yellow CP
Diamine Orange B, F.

Green and Olive:

Diamine Green B, G, CL, 2209J, 2210J
Diamine Dark Green N;

for Olive shaded with

Diamine Yellow CP
Diamine Orange B
Diamine Brown 3G;

for saddening:

Diamine Black HW.

Brown:

Diamine Fast Brown G, R, GB
Diamine Brown 3G, M, R, B
Diamineral Brown G
Diamine Catechine 3G, G
Oxy Diamine Brown G.

Violet and Prune:

Diamine Fast Violet BBN
Diamine Violet N, BB
Oxy Diamine Violet B, G, R, BF.

Grey and Black:

For Grey:

Diamine Grey G
Diamine Fast Grey BN.

For Black dyed direct:

Oxy Diamine Black JE, JEI, JB, JW, FFC, BM
Union Black S, P, BG, BB, 3B.

For diazotised Black:

Diaminogene B, extra
Diamine Black DB
Diamine Neron BB
} diazotised and developed with Phenylene Diamine.

Directions for Dyeing with Diamine and Union Colours.

Dye to best advantage for about an hour boiling hot either in a neutral boiled-off liquor, very slightly acidulated with acetic acid, or, if no boiled-off liquor be available, with the addition of 10% Glauber's salt crystals and 5% acetate of ammonia. Sufficient penetration having been attained, a little acetic acid is added gradually until the bath is nearly exhausted.

The diazotising and developing is carried out according to the directions on page 23.

C. DYEING WITH DUATOL COLOURS.

Some of the Duatol Colours, like the Diamine Colours, may be used to very good advantage in silk dyeing, and possess the advantage of dyeing the material very well through, at the same time exercising a favourable influence on the gloss of the silk.

The following are particularly well suited:

Duatol Yellow 2881J, 2776J, 2816J
Duatol Scarlet G, 2882J, K10B
Duatol Bordeaux B
Duatol Red 2778J

Duatol Brown R, B, 2817J
Duatol Grey 2819J
Duatol Green 2779J
Duatol Blue Green 2818J
Duatol Brilliant Blue R
Duatol Blue B
Duatol Black 3B, BT.

Directions for Dyeing with Duatol Colours.

Dye for about an hour in a boiling hot neutral bath containing 1—2 lbs Glauber's salt crystals per 10 gallons liquor, subsequently adding a little acetic acid gradually if necessary in order to exhaust the bath.

D. DYEING WITH BASIC COLOURS.

For dyeing silk, and particularly for producing bright shades, Basic Colours are also sometimes used which offer the advantage of penetrating very well and covering worn-off portions of the garments to be re-dyed.

The following products are particularly well suited for the purpose:

Irisamine G
Rosazeïne 6G
Safranine } all brands
Magenta }
Cerise Ia.
Tannin Heliotrope
Methyl Violet, all brands
Crystal Violet 5B bluish, 10B
New Methylene Blue, all brands
Victoria Blue B
Indazine M
Naphtindone BB, BR
Brilliant Green Crystals extra
Solid Green Crystals O
Thioflavine T, TCN
Diamond Phosphine GG, R
Para Phosphine R, GG, G

Tannin Orange R
Chrysoïdine } all brands
Bismarck Brown }
Black for Artificial Silk BN, GN, TN.

Directions for Dyeing with Basic Colours.

Basic Colours, for the production of light shades, are to best advantage dyed warm to boiling hot in a fatty soap bath. Medium and deep shades should be dyed in a boiling hot boiled-off liquor acidulated with acetic or formic acid; by increasing the quantity of acetic or formic acid, a better penetration is effected.

DYEING OF HALF-SILK GARMENTS, UPHOLSTERY GOODS, RIBBONS, ETC.

(Silk and Cotton.)

For the dyeing of half-silk goods composed of silk and cotton, the one-bath method with Diamine Colours is the simplest and most extensively applied, offering the advantage of dyeing uniform, or practically uniform, shades, on the silk and cotton, any deviation between the shades of the two fibres being subsequently compensated by topping with Basic or Acid Colours. Another method is also applied sometimes by dyeing in several baths, particularly for the production of very bright shades of violet, blue, green and crimson, first the silk being dyed with suitable Acid or Basic Colours, then the cotton with Basic Colours after previously mordanting with tannin and antimony.

The preparatory treatment for dyeing half-silk goods is the same as that for silk goods, a boiling with soap thus being most to the purpose.

A. DYEING WITH DIAMINE COLOURS.

Of the Diamine Colours those indicated in the tables below are the best suited; their behaviour towards cotton and silk may be seen from the tables.

Yellow and Orange:

I. Diamine Colours which dye cotton and silk the same or approx. the same shade	II. Diamine Colours which dye cotton more strongly than silk or which dye cotton and silk in deviating shades	III. Diamine Colours which dye cotton principally, leaving silk practically undyed
Thioflavine S	Diamine Fast Orange EG, ER	Diamine Fast Yellow A, AGG, AR
Oxy Diamine Yellow TZ, GG, NY200		Diamine Orange G, D.
Diamine Yellow N, CP		
Diamine Fast Yellow B, M, FF, 3G		
Diamine Orange B, F		
Oxy Diamine Orange G, R		

Pink, Red and Claret:

Diamine Rose BD, GD, BG, FFB	Diamine Fast Scarlet GFF, 4BFF, 5BFF, 7BFF, 8BF, 10BF	Direct Rose T
Direct Rose T	Diamine Aldehyde Scarlet GG	Diamine Fast Scarlet GFF, 4BFF, 5BFF, 7BFF, 8BF, 10BF
Diamine Red 4B, 5B, 6B, 10B, D	Diamine Brilliant Rubine S	Diamine Brilliant Rubine S
Cotton Red A	Diamine Fast Bordeaux 6BS	(in light and medium shades only)
Diamine Purpurine B, 3B, 6B, V		
Diamine Fast Red F, 8BL		
Diamine Violet Red		
Diamine Bordeaux B, S, VRO		
Diamine Brilliant Bordeaux R		

I. Diamine Colours which dye cotton and silk the same or approx. the same shade	II. Diamine Colours which dye cotton more strongly than silk or which dye cotton and silk in deviating shades	III. Diamine Colours which dye cotton principally, leaving silk practically undyed

Blue and Dark Blue:

Diamine Blue RW	Diamine Blue 2B, 3B, BG, BX, 3R	Diamine Sky Blue
Diamine Steel Blue L	Diamine Brilliant Blue G	Diamine Sky Blue FF
Diamine Dark Blue B	Diamine Bengal Blue R	Diamine Pure Blue A
Diamine Bengal Blue G	Diamineral Blue R, B, CV, CVB	Diamine Black BH, BHF, BHN
	Diamine Blue No. 52, 53, 55, 56	Diamine Blue 2B, 3B / Diamineral Blue R, BF / Oxy Diamine Blue 5G, PG, PB, PR / Diamine Fast Blue FFB, FFG / Diamine Brilliant Blue G — in light and medium shades only
	Diamine Azo Blue No. 54, R, RR	
	Diamine New Blue G, R	
	Diamine Fast Blue FFB, FFG, BN, G	
	Oxy Diamine Blue B, G, 3G, 5G, R, 3R	
	Diamine Aldehyde Blue B	

Green and Dark Green:

Diamine Green B, G, CL, FG	Diamine Green HS or combinations of Diamine Sky Blue and Diamine Fast Yellow AGG	Combinations of Diamine Sky Blue and Diamine Fast Yellow AGG in light shades
Diamine Dark Green N		

Brown and Olive:

Diamineral Brown G	Diamine Fast Brown G, R, GB	Diamine Fast Brown GB, Diamine Catechine B — in light shades only
Oxy Diamine Brown G, RN, 3GN	Diamine Catechine B	
Diamine Catechine G, 3G	Diamine Bronze G	
Diamine Brown M, MR, R, S, B, BWA, GWA, 3G, 5G, ATC, No. 30a, 33, 36, 37, 40, 42a, 43, 44		

I. Diamine Colours dyeing cotton and silk the same or nearly the same shade	II. Diamine Colours which dye cotton more strongly than silk or which dye cotton and silk in deviating shades	III. Diamine Colours which dye cotton principally, leaving silk practically undyed
Violet:		
Diamine Violet N, BB Diamine Heliotrope G, O, B	Oxydiamine Violet R, B, BF Diamine Fast Violet FFBN, FFRN, BBN Diamine Brilliant Violet B, RR	
Grey and Black:		
Diamine Grey G Oxydiamine Black JE, JEI, JR, JW, A AT, D, AM, BM, FFC, FFN, SA, US, SOOO Diaminogene B Oxydiaminogene FF, FFG, OT Diamine Black DN, DB Diamine Neron BB, BBG (diazotised and developed with Phenylene Diamine.)	Paradiamine Black B, BB, FFD, FFB, FF extra conc.	Diamine Black RMW Diamine Black BH, BHF, BHN, dyed direct or diazotised and developed.

Diamine Scarlet B, 3B, Cotton Brown A, N, Diamine Fast Grey BN, RN and Diaminogene extra dye the silk considerably deeper than the cotton.

Directions for Dyeing with Diamine Colours.

Dye for about 1 hour in a boiling hot bath containing 3—6 oz soap, ¾ oz soda or borax and 1—2 lbs Glauber's salt crystals per 10 gallons liquor. By boiling, or at elevated temperatures, the dyestuffs go more on to the silk; by dyeing at a lower temperature on the other hand the dyestuffs go more on to the cotton, deeper shades also being obtained by increasing the amount of Glauber's salt. It is of

advantage to always dye the cotton a somewhat deeper shade than the silk, because the latter will in any case absorb a good deal of colour in the subsequent acid-dyeing. After dyeing, rinse, brighten slightly with acetic acid, or top with Acid or Basic Colours.

Blue shades produced with the addition of Alkaline Blue should be raised hot with sulphuric acid.

Direct Blacks are best dyed without any soap but with 2—4 lbs Glauber's salt only, or with 2—4 lbs Glauber's salt crystals and ¾ oz soda or borax per 10 gallons liquor.

Diazotised Blacks produced with Diaminogene B, Oxydiaminogene FF or OT, are dyed boiling hot with the addition of 2—4 lbs Glauber's salt crystals per 10 gallons liquor and 1—2% acetic acid (calculated on the weight of the goods to be dyed); the diazotising and developing is carried out in accordance with the directions on page 23; a subsequent hot soaping and brightening in acetic acid is to be recommended.

For Blacks, a combination of Diamine Colours and logwood is in many cases given the preference over direct shades of Diamine Colours by themselves. The goods are to this end mordanted with nitrate of iron 18—23° Tw., rinsed well, bottomed hot with 3—5% fustic extract, and dyed in a fresh bath with 4—5% Oxydiamine Black SOOO or Paradiamine Black BB, 0.5% Diamine Fast Yellow A, 5—10% logwood extract and the addition of 8 oz soap and 2—4 lbs Glauber's salt crystals per 10 gallons liquor at a temperature of 80—90° C. (175—195° F.). Hereafter rinse, and brighten slightly with acetic acid.

Directions for Topping Half-Silk dyed with Diamine Colours.

For topping goods previously dyed as above described, either Acid or Basic Colours may be used. Acid Colours serve for shading the silk alone, Basic Colours dyeing both silk and cotton; the dyestuffs of both groups are dyed in baths acidified with about 10—15% acetic acid or 2—3% formic acid, and may if necessary be applied in the same bath. The

goods are mostly topped cold or lukewarm; raising the temperature causes the dye to go more on to the silk.

Any of the Acid Colours mentioned on pag. 35—40 and of the Basic Colours enumerated on pages 44 and 45 may be used.

As the shades of certain Diamine Colours, for instance Diamine Red 4B, 5B, 10B, Diamine Bordeaux B, Diamine Brown R, V, are dulled somewhat by the addition of acids, it is necessary to again well rinse the goods subsequently.

Directions for Dyeing in Two Baths.

Dye the silk first with any of the Acid or Basic Colours mentioned on pages 35—40 or 44—45, rinse, mordant cold with 4—6 % tannic acid, 2—3 % antimony salt, rinse, and dye with Basic Colours from cold to lukewarm; finally soap hot, and brighten with acetic acid.

As already pointed out, this process is resorted to exclusively for the production of very bright shades.

DYEING OF MATERIALS COMPOSED OF WOOL AND SILK.

Goods made of wool and silk are generally dyed in acid baths, but depending on the original colour and the quality of the material may in certain cases be dyed in neutral baths with Diamine or Duatol Colours, or more rarely with Basic Colours in neutral baths or in baths feebly acidified with acetic acid.

The first-mentioned method is applied the most because it preserves the quality of the wool and the lustre of the silk best. During the dyeing the material should be treated with the greatest possible care, in order to prevent it from being impaired by pressing or scraping; the dyeing of the goods on a frame ("à ressort") is also of great advantage.

The cleaning of the goods is best done in weak soda baths or moderately hot soap baths.

A. DYEING IN ACID BATHS.

As wool generally shows a greater affinity for Acid Colours than silk, such dyestuffs should above all be used for the dyeing of fabrics composed of wool and silk as go very well on to the silk. They should at the same time level easily and cover worn out places as well as possible.

The following are best suited for this purpose:

Rose, Red and Claret:

For pink shades:

Rosazeïne B, 13
*Erythrosine B
*Eosine GGF

for bright Reds

Brilliant Croceïne, all brands
Scarlet EC

may be used; for fuller shades of Red,

Croceïne AZ
Roccelline
Azo Orseille KWS
Acid Magenta.

Claret shades are obtained by saddening the last mentioned dyestuffs with

Acid Violet 6BS
Tetra Cyanole V, extra
Cyanole extra.

Blue and Navy Blue:

For light and medium Blues:

Cyanole FF, extra
Tetra Cyanole V, SF, A, extra
Brilliant Milling Blue B, FF, FG
Formyl Blue B
Pure Soluble Blue
Water Blue B, R
Alkaline Blue, all brands;

for Navy Blues:

Navy Blue KWSG, KWSR
Solid Blue R, 3R

shaded with

Tetra Cyanole V, extra
Acid Violet 6BS
Azo Orseille KWS
Orange extra.

Yellow and Orange:

China Yellow B
Fast Acid Yellow 3G
Indian Yellow G, R, FF
Tropaeoline RNP
Orange EN, R, extra.

Green and Dark Green:

Cyanole Fast Green G
Brilliant Milling Green B
Acid Green extra conc.
shaded with
China Yellow B
Indian Yellow G, R, FF
Tetra Cyanole A
Acid Violet 6BS;
for Dark Green saddened with
Navy Blue KWSG, KWSR
Orange extra, EN
Azo Orseille KWS.

Brown and Olive

are produced with combinations of
Tetra Cyanole V
Brilliant Milling Green B
Navy Blue KWSG, KWSR
Indian Yellow G, R, FF
Tropaeoline RNP
Orange extra, EN
Azo Orseille KWS.

Violet:

Formyl Violet S4B, 4BF, 6B, 10B
Acid Violet 6BS, 6BC.

Black:

For bluish Blacks:
*Alphanol Black BG, 3BN, K4B
*Gloria Black B
*Neutral Wool Black B, G
Naphtylamine Black 4B, 6B
shaded with
Formyl Violet S4B, 6B, 10B
Formyl Blue B
Brilliant Milling Blue B
Brilliant Milling Green B;

for more covered Blacks:

*Alphanol Black KWAN conc., KV
*Gloria Black I, II
*Neutral Wool Black B, G

shaded with

Indian Yellow G, R
Tropaeoline RNP.

Directions for Dyeing in Acid Baths.

These dyestuffs are dyed as a rule in strongly acid baths with the addition of about 10% Glauber's salt crystals and 10—15% bisulphate of soda or 15—20% Glauber's salt and 3—4% sulphuric acid. Enter the goods at about 60—70° C. (140—160° F.), and raise slowly to the boil, but do not boil more than ½ hour. Hereupon allow the bath to cool off to about 60° C. (140° F.), rinse, and dry. By prolonged boiling or by using only a small quantity of acid, the wool is dyed deeper than the silk, whereas at a lower temperature and with larger additions of acid the dyestuff goes more on to the silk.

The Eosines, Erythrosines, Neutral Wool Blacks, Gloria Blacks and Alphanol Blacks marked with an asterisk (*) are best dyed with the addition of 10% Glauber's salt crystals and 10% acetic acid 30%, or 2—3% formic acid 85%.

For full shades in particular it is of great advantage to begin with only one-half of the quantity of dyestuff required, to boil for ½ hour and then to add the second half of the dyestuff continuing to work without boiling. The goods are then treated in the cooling bath at 60—70° C. (140—160° F.) for ¼ to ¾ hour, by which means full shades are obtained on the silk principally.

In certain cases small quantities of Basic Colours may be added simultaneously to the acid bath, even during prolonged boiling, as they go chiefly on to the silk and cover worn places specially well.

The following Basic Colours are best suited:

Magenta } all brands
Safranine }
Brilliant Green Crystals extra
Solid Green Crystals O
Thioflavine T, TCN
New Methylene Blue GG, N
Indazine M
Tannin Orange R
Bismarck Brown, all brands
Methyl Violet, all brands

These dyestuffs should however be used in small quantities and be added only towards the end of the dyeing operation, as the goods are otherwise apt to smut. Provided the wool has not already been dyed too deep a shade, the silk may also be dyed subsequently with the Basic Colours mentioned, in a fresh lukewarm bath acidified with some acetic acid.

If the application of Basic Colours is to be excluded, Acid Colours may also be used for dyeing the silk subsequently, but this is best done in a fresh lukewarm bath with a slight addition of sulphuric acid. The following are specially suited for this purpose:

Milling Yellow O
Tropaeoline RNP
Brilliant Croceïne, all brands
Azo Orseille KWS
Croceïne AZ
Milling Red FR
Acid Magenta
Rosazeïne B
Cyanole FF
Tetra Cyanole V, SF
Brilliant Milling Blue B
Water Blue B, R
Navy Blue KWSG, KWSR
Acid Violet 6BS
Formyl Violet S4B
Brilliant Milling Green B
Naphtol Blue G
Naphtol Blue Black
Naphtylamine Black ESN.

Alkaline Blue and Alkaline Violet are dyed at 80—90° C. (175—195° F.) with the addition of 1—2% soda crystals or 4—5% borax, rinsed, and brightened hot with sulphuric acid.

For the production of light, brilliant shades, certain Acid Colours may be used in feebly alkaline

soap baths, especially on goods previously bleached with peroxide of hydrogen, whereby brighter shades are obtained than in acid baths.

The following products are specially adapted for this purpose:

Alkaline Blue, all brands	Rosazeïne B
Alkaline Violet CA, C	Indian Yellow G, FF, R
Formyl Violet S4B	Orange extra
Brilliant Milling Blue B	Brilliant Milling Green B.

Dye in a gently boiling bath with the addition of 2—3 oz soap and 1½—3 oz phosphate of soda per 10 gallons liquor; in the case of Alkaline Blue with 4—5% borax and soap. An addition of 3—8 oz Glauber's salt per 10 gallons liquor effects a better absorption of the dyestuff.

Hard water must be corrected previous to the soap being added, by boiling with some soda; an excess must however be avoided, as it would be apt to cause the wool to assume a yellow tinge.

B. DYEING IN NEUTRAL BATHS WITH DIAMINE COLOURS.

The dyeing with Diamine Colours is specially to be considered for tightly woven cloths difficult to penetrate; for this work those Diamine Colours are used for preference which have the property of covering wool and silk as uniformly as possible; for shading, neutral-dyeing wool colours may also be used.

The following products are specially to be recommended:

Yellow and Orange:

Thioflavine S
Oxydiamine Yellow TZ
Diamine Fast Yellow FF, 3G, M
Diamine Yellow CP
Diamine Orange F, B.

Rose, Red and Claret:

Diamine Rose BD, GD
Diamine Scarlet B, 3B
Diamine Red 4B, 5B
Diamine Fast Red F, 8BL
Diamine Bordeaux S
Diamine Brilliant Bordeaux R;
for shading:
Rosazeïne B.

Violet:

Diamine Fast Violet BBN
Diamine Violet N
Oxydiamine Violet B, R;
for shading:
Formyl Violet S4B.

Blue and Navy Blue:

Diamine Sky Blue FF
Diamine Blue RW
Oxydiamine Blue 5G, 3G, G, B, R
Diamine Brilliant Blue G
Diamine New Blue G, R
Diamine Steel Blue L
Diamine Dark Blue B;
for shading:
Tetra Cyanole A
Formyl Blue B
Brilliant Milling Blue B, FF, FG
Brilliant Milling Green B.

Green and Dark Green:

Diamine Green FG
Diamine Dark Green N;
for shading:
Brilliant Milling Green B
Indian Yellow G
Diamine Yellow CP.

Brown and Olive:

Diamine Catechine 3G, G
Diamine Brown 3G, R, M, B, V
Diamineral Brown G
Oxydiamine Brown G, 3GN;
for shading:
Diamine Yellow CP
Orange extra
Diamine Black DN, HW
Naphtol Blue Black.

Olives are obtained by shading with
Diamine Green G, FG
Diamine Dark Green N
Brilliant Milling Green B
Indian Yellow G, R, FF.

Black:

Diamine Black DN, HW
Oxydiamine Black JB, JWF
Union Black S, KD.

Directions for Dyeing in Neutral Baths with Diamine Colours.

Dye with the addition of 1—2 lbs Glauber's salt crystals per 10 gallons liquor; enter at 60° C. (140° F.), raise to the boil, and boil gently for ½ to ¾ hour. If the wool should not have assumed a sufficiently deep shade, some acetic acid (1—2%) should be added; for the blue Diamine Colours an addition of 2—4% acetic acid is always useful.

Prolonged boiling causes the dyestuffs to go more on to the wool, the silk being best covered in the cooling bath at about 50—60° C. (120—140° F.); the silk may also be covered subsequently in a fresh, lukewarm bath, slightly acidulated with sulphuric acid, the Acid Colours enumerated on page 56 being adapted for this purpose.

After dyeing, rinse well, and brighten with acid.

C. DYEING IN NEUTRAL BATHS WITH DUATOL COLOURS.

The Duatol Colours are equally as important for the dyeing of wool-silk goods as they are for the dyeing of half-wool; they very favourably affect the character of the wool, and spare the lustre of the silk. The following brands are suited:

Duatol Yellow 2881J, 2776J, 2816J
Duatol Orange 2777J, 2780J
Duatol Brown 2817J
Duatol Scarlet G, 2882J, K10B
Duatol Bordeaux B
Duatol Red 2778J
Duatol Brown R, B
Duatol Grey 2819J
Duatol Blue Green 2818J, 2779J
Duatol Brilliant Blue R, B
Duatol Black 3B, BT, 2902J.

Dyeing Directions for Duatol Colours.

Dye same as the Diamine Colours with an addition of 2 lbs Glauber's salt crystals per 10 gallons liquor; enter the goods at 60° C. (140° F.), raise to the boil, and boil for ¼ to ½ hour, until the wool has assumed a sufficiently deep shade. Finally work for another ½ hour in the cooling bath, in order to dye the silk to shade.

D. DYEING WITH BASIC COLOURS.

The following Basic Colours are especially well suited for the production of light and brilliant shades and dye silk and wool very evenly:

Magenta, all brands	Thioflavine T
Tannin Heliotrope	Methyl Violet, all brands
Brilliant Green Crystals extra	Crystal Violet 10B
Solid Green Crystals O	Chrysoïdine, Bismarck Brown } all brands

Dyeing Directions for Basic Colours.

Dye in a boiling hot bath, neutral or slightly acidulated with acetic acid, then rinse, and brighten with acetic acid. Very light shades may also be dyed in a neutral soap bath, or with the addition of 3—4½ oz soap and 1½—3 oz phosphate of soda per 10 gallons liquor.

DYEING OF GARMENTS AND UPHOLSTERY GOODS COMPOSED OF WOOL, SILK AND COTTON.

Materials of this kind are best dyed by the one-bath process with Diamine or Duatol Colours, which cover the three fibres uniformly. The wool and the silk may however also be dyed first according to the directions given on pages 51—55, the cotton being then dyed in a fresh bath with the dyestuffs indicated on pages 18 and 19.

A. DYEING WITH DIAMINE COLOURS.

The following Diamine Colours possess the property to dye wool, silk and cotton practically uniform shades:

Thioflavine S
Oxy Diamine Yellow TZ, GG
Diamine Fast Yellow M, 3G
Union Fast Yellow G
Diamine Orange F, B
Diamine Rose BD, GD
Diamine Scarlet B, 3B
Diamine Red 4B, 5B
Diamine Fast Red F, 8BL
Union Fast Red R
Union Fast Bordeaux FR
Diamine Bordeaux B, S
Diamine Brilliant Bordeaux R
Diamine Violet N, 2205J
Oxy Diamine Violet B, G
Light Blue 5380
Diamine Blue RW
Oxy Diamine Blue 5G, 3G, G
Union Blue KBJ, 2168J, BJ, KHS, 2570J
Union Navy Blue 5723J
Diamine Steel Blue L, 2206J
Diamine Catechine G, 3G
Diamine Brown R, M, BWA, GWA, Nr. 40, 42, 44
Oxy Diamine Brown G, 3GN
Diamineral Brown G
Union Brown 1926J, 2089J, 2571J, 2865J, 4221J, 4354J
Diamine Green B, G, CL, 2209J, 2210J
Diamine Dark Green N
Union Green 4481J
Diamine Black HW
Union Black S, 5830J
Oxy Diamine Black SOOO, JEI, JB, JW
Universal Black KB.

The following are suited for shading the wool and the silk in the same bath:

Milling Yellow O
Indian Yellow G, R, FF
Orange extra, II, R
Roccelline
Rosazeïne B
Irisamine G
Wool Red B
Milling Red G
Brilliant Milling Green B
Brilliant Milling Blue B
Formyl Blue B
Alphanol Blue BR extra, GN, 5RN
Formyl Violet S4B
Alkaline Violet C, CA
Neutral Wool Black B, G
Alphanol Black BG, R.

Directions for Dyeing with Diamine Colours.

Charge the bath with 1—2 lbs Glauber's salt crystals per 10 gallons liquor, enter at about 60° C. (140° F.), raise to the boil, boil for about ¼ hour, and then allow to cool for ½ to ¾ hour.

If the wool should be found too light in shade, the bath is boiled up again, wool colours being added if necessary for shading. Should the cotton and the silk be too light in shade, dyeing is continued without boiling with the addition of corresponding quantities of the Diamine Colours named overleaf; the silk alone may be brought to shade in a fresh bath according to the directions on page 56.

B. DYEING WITH DUATOL COLOURS.

Duatol Colours are used for the dyeing of cloth consisting of wool, silk and cotton under the same conditions as stated on page 60.

The following brands are especially well suited:

Duatol Scarlet 2882J, K10B
Duatol Red 2778J
Duatol Blue Green 2818J
Duatol Blue B, BD
Duatol Bordeaux B
Duatol Brown B, R
Duatol Brilliant Blue R
Duatol Black 3B, BT.

Directions for Dyeing with Duatol Colours.

Dye according to the directions on page 33; when dyeing however goods consisting of wool, silk and cotton, boil only for ¼ to ½ hour, allowing the goods then to feed for ½ to ¾ hour in the cooling bath. After dyeing, rinse well, and brighten with some acetic acid or formic acid.

DYEING OF WOOL, HALF-WOOL AND COTTON CONTAINING ARTIFICIAL SILK SHOTS.

The extensive application which artificial silk is finding nowadays in the textile industry warrants the issue of some directions for dyeing goods containing this material.

Wool goods containing artificial silk effect threads are best dyed with Diamine Colours by the one-bath method, for very light shades and Black in combination with the requisite Wool Colours, according to the directions on pages 25 to 32 for Half-Wool. For medium and deep shades, the wool is best dyed first with Acid Colours in the customary manner; the goods are then rinsed well, the artificial silk being subsequently dyed with Diamine Colours in a cold to lukewarm bath with the addition of 1—2 lbs Glauber's salt crystals per 10 gallons liquor. The products suited for this purpose are enumerated on pages 18 and 19.

Half-Wool goods containing artificial silk effect threads are likewise to best advantage dyed by the two-bath method, i. e. by dyeing the wool in an acid bath, rinsing, and then dyeing the cotton and artificial silk together in one bath. The following products are very well suited for the latter purpose:

Thioflavine S
Oxy Diamine Yellow TZ
Diamine Fast Yellow FF, AGG, A
Diamine Orange G, D
Diamine Fast Orange EG, ER
Diamine Fast Brown G, R, GB
Diamine Catechine G, B
Oxy Diamine Brown RN
Diamine Brown M, S, ATC
Diamine Rose GD, BD
Diamine Red 4B
Cotton Red A
Diamine Purpurine B, 6B
Diamine Fast Scarlet 4BFF, GG
Diamine Brilliant Rubine S
Diamine Bordeaux B
Diamine Violet N, RB, BB
Diamine Heliotrope G, O, B
Oxy Diamine Violet R, G, BF
Diamine Fast Violet BBN
Diamine Brilliant Violet RR
Diamine Sky Blue FF
Diamine Blue RW
Diamineral Blue BF, 3B, CVB

Diamine New Blue R	Isamine Blue 8B, 6B, B, R
Diamine Fast Blue FFG, FFB	Diamine Bengal Blue G
	Diamine Steel Blue L
Diamine Dark Blue B	Diamine Green G, FG, HS.

The acid-dyed goods are rinsed well, and then dyed for 1 hour with any of the afore-mentioned products in a fresh bath of 25—30° C. (75—85° F.) with the addition of 1—2 lbs Glauber's salt crystals and 1½—3 oz monosolvol per 10 gallons liquor, hereafter rinsed thoroughly, and brightened mildly with acetic acid. When using Isamine Blue (for light blue shades), some acetic acid (3—4 oz per 10 gallons liquor) should be added to the dyebath.

Certain Diamine Colours dye cotton and artificial silk fairly uniform shades in a hot bath, and may therefore, when suitably shaded with neutral dyeing Wool Colours, be used for dyeing by the one-bath method. It is then best to dye at 70° C. (160° F.) with the addition of ½—1 lb Glauber's salt crystals and 3 oz monosolvol per 10 gallons liquor.

The following dyestuffs are suitable for this purpose:

Thioflavine S
Oxy Diamine Yellow TZ, CR
Diamine Fast Yellow A, AGG, B, FF, M
Diamine Orange G, D, B
Diamine Nitrazol Brown GF
Diamine Azo Scarlet B, A
Diamine Red 4B
Diamine Purpurine B.

Should the cotton and the artificial silk not be uniform enough in shade, a light topping with Basic Colours in a cold bath, slightly acidulated with acetic acid, will have the desired effect.

Black is best produced by first dyeing the artificial silk and cotton at 70° C. (160° F.) with

Diamine Black BH, BHF, BHN
Diaminogene B
Oxy Diaminogene OB, OT

and the addition of 1—2 lbs Glauber's salt crystals and ¾ oz soda ash per 10 gallons liquor, then

rinsing, diazotising, developing with Phenylene Diamine, and finally dyeing the wool with an Acid Black.

The dyeing of *cotton goods containing artificial silk effects* presents certain difficulties in as far as the artificial silk always has the tendency to absorb the dyestuff more readily than the cotton, and as a result the former fibre is apt to be dyed a considerably deeper shade. In order to avoid this, it has proved advantageous to dye only lukewarm or cold. Diamine Colours are the only dyestuffs to come into consideration for this purpose, and may be brightened with Basic Colours if necessary. The following products are especially well suited:

For Yellow and Orange:

*Thioflavine S
Diamine Yellow CP
*Diamine Fast Yellow A, AGG, B, FF, 3G
*Diamine Orange G, D, F
*Diamine Fast Orange EG, ER.

For Pink and Red:

Diamine Rose GD, BD, FFB
Diamine Fast Scarlet 4BFF, 7BFF
Diamine Fast Red 8BL
Diamine Brilliant Rubine S
Diamine Bordeaux B
Diamine Fast Bordeaux 6BS.

For Violet:

Diamine Brilliant Violet RR, B
Diamine Fast Violet FFRN, FFBN
Oxy Diamine Violet G, B
Diamine Heliotrope O, B, G.

For Blue and Grey:

Diamine Sky Blue FF
Diamine Blue BB, 3B, RW
*Diamineral Blue CV, CVB, 3RC
Diamine Fast Blue FFB, BN

Diamine Brilliant Blue G
*Diamine Dark Blue B
Diamine Black BH
Diamine Fast Grey BN.

For Green:

Diamine Green CL, B, G, FG
Diamine Dark Green N.

For Brown:

Diamine Fast Brown R, G, GB
Diamine Brown M, S
Diamine Catechine G
Oxy Diamine Brown RN, 3GN.

For Black:

Diamine Black DN, developed with Phenylene Diamine or

Para Diamine Black FFB, dyed direct, shaded with some Diamine Orange D.

The above-mentioned products are best dyed at 25—30° C. (75—85° F.). The products marked with an asterisk (*) yield uniform shades even when dyed at a fairly high temperature (50—60° C. or 120—140° F.). The following ingredients should be added to the dye-bath:

For light shades:

3—4 oz soap and 3—4 oz soda ash per 10 gallons liquor, and

for deep shades:

1—2 lbs Glauber's salt crystals
¾—1½ oz soda ash and
3—4 oz monosolvol per 10 gallons liquor.

The production of uniform, very full shades on the artificial silk and cotton presents certain difficulties in as far as the artificial silk even at a low temperature absorbs more dyestuff and consequently assumes a deeper shade than the cotton. It is necessary here to retard the exhaustion of the dyestuff by a suitable treatment, viz. by working the material for a few hours in a tannin

bath of 60—70° C. (140—160° F.) containing 10—15% tannic acid calculated on the weight of the goods, and then entering into a second, lukewarm bath charged with two-thirds the weights of tin crystals as of tannic acid used. Tin crystals are best dissolved with the addition of some hydrochloric acid. This treatment must be followed by a thorough rinsing.

Goods prepared in this manner are dyed according to the directions above stated, the temperature being raised if necessary to 50 or 60° C. (140—160° F.). By working in the right way, the artificial silk will remain somewhat lighter even than the cotton in shade.

For especially bright shades it is advisable to top with Basic Colours which are one and all suitable for this purpose, but the New Methylene Blues, Safranines, and Magenta and Cerise brands, are those which are especially well suited.

DYEING OF COTTON GARMENTS, UPHOLSTERY GOODS, HOSIERY, ETC.

For dyeing cotton goods, Diamine Colours are in the first place used, which by the one-bath method without previous mordanting yield practically any shade desired and as a rule answer all normal demands for fastness. Of the Diamine Colours, the group of the Diamine Fast Colours deserve special mention, most of which are noted for their excellent fastness to light, a property which renders them especially suitable for dyeing curtains and upholstery goods. There are also a number of Diamine Colours deserving special mention, the fastness to light of which is considerably increased by a suitable treatment with metallic salts, or which either by such treatment or by diazotising or by coupling yield shades of very good fastness to washing such as are for instance desirable for hosiery and knit goods.

For dyeings of particularly good fastness to washing, especially in the case of hosiery, the Immedial Colours come into consideration; and when the very highest demands for fastness are made, the Hydron Colours are the products to be used. A special description of the application of these dyestuffs will also be found on the ensuing pages.

Basic Colours are used less frequently, chiefly for the production of especially brilliant shades of crimson, violet, green and blue on material previously mordanted with tannin and antimony; they are frequently also employed for brightening shades produced with Diamine or Immedial Colours on which they are fixed without any special mordanting.

Cotton goods are usually prepared for dyeing by a thorough boiling in a weak soda bath; goods with a heavy finish, or starched goods, are to good

advantage treated first for a few hours in a lukewarm bath containing 3—6 oz Diastafor per 10 gallons liquor and some acetic acid. Goods which are very much faded should first be stripped with Hyraldite or bleached with chlorine; see pages 5 and 132.

A. DYEING WITH DIAMINE COLOURS.

Any of the Diamine Colours may be used for the dyeing of cotton goods; in the following however only those are mentioned which are especially well suited for Garment Dyeing, in the first place those that are noted for their good levelling power and relatively good fastness to light. The products answering the last-mentioned requirement are marked with an asterisk (*) in the following tables:

Pink, Red, Claret:

*Diamine Rose BD, GD, BG, FFB

which may be shaded for salmon shades with

*Diamine Fast Orange EG, ER
*Diamine Orange G, D,

and for brightening and topping,

Irisamine G
Safranine GGS

are used.

The following should be used for bright scarlet shades and reds:

Diamine Fast Scarlet GFF, 4BFS, 4BFF, 7BFF, 8BF, 10BF, L3B, L4G
Diamine Red 4B, 5B, 6B, 10B
Diamine Purpurine B, 3B, 6B
*Diamine Fast Red F, 8BL.

For Claret:

*Diamine Fast Bordeaux 6BS
Diamine Brilliant Bordeaux R
Diamine Bordeaux B, S
Diamine Brilliant Rubine S.

For saddening or shading:

Oxy Diamine Violet R, BF
Diamine Heliotrope B, O
*Diamine Fast Violet BBN
*Diamine Fast Blue BN, FFB.

For red shades of specially good fastness to washing:

Primuline
Diamine Azo Scarlet 4B, 4BL extra, 8B } diazotised and developed with Beta Naphtol.

For claret shades fast to washing:

Primuline, developed with Bordeaux Developer
Diamine Azo Bordeaux R, developed with Beta Naphtol.

To increase the brightness, red and claret shades may be topped or brightened with Basic Colours, for preference with the various brands of Safranine, Magenta or Tannin Heliotrope.

Light Blue, Blue, Navy Blue:

For Light Blue:

Diamine Sky Blue
Diamine Sky Blue FF.

For fuller shades of Blue:

*Diamine Fast Blue FFG, FFB, G, BN
Diamine Blue 3B, 2B, BX, 3R, BG, RW
Diamine Brilliant Blue G
Oxy Diamine Blue 5G, 3G, G, R, PG, PB, PR
Diamine Bengal Blue G, R.

For Blues of especially good fastness to light:

*Diamine Sky Blue FF
*Diamine Blue RW
*Oxy Diamine Blue 5G, 3G, G } aftertreated with copper sulphate.

For Navy Blue:

Diamineral Blue R, B, BF, CV, CVB
Diamine Deep Blue B, R
Diamine Black BH, BHN, BHF
Diamine Dark Blue B.

The various Oxy Diamine Blacks and Para Diamine Blacks may be used for saddening.

For greenish Blue:

Diamine Steel Blue L.

Dark Blues of good fastness to washing and light are produced with

*Diamineral Blue R, B, BF, CV, CVB
*Diamine Deep Blue B, R
*Diamineral Brilliant Blue B,

being aftertreated in a fresh boiling bath with bichrome and copper sulphate. The following likewise yield blues of very good fastness to washing and light, and may be used as substitutes for Indigo Blue:

*Diaminogene Sky Blue N, 3B
*Diaminogene Blue BB, NA, NB
shaded with
Diamine Azo Blue RR or
Diamine Black BH
} diazotised and developed with Beta Naphtol.

For topping or for producing especially bright shades, New Methylene Blue GG, N, R, 3R should be used.

Cream, Yellow and Orange:

According to the shade to be produced,

*Diamine Fast Yellow A, B, FF
*Diamine Orange G, D
*Diamine Fast Orange EG, ER

are particularly well suited for cream shades and are largely employed for dyeing curtains in particular.

For greenish Yellow:

Thioflavine S
Oxy Diamine Yellow TZ
*Diamine Fast Yellow 3G, AGG.

For fuller shades:

*Diamine Fast Yellow A, B, FF, M
*Diamine Yellow CP.

For Orange:

*Diamine Fast Orange EG, ER
Diamine Orange D*, G*, B, F.

Green, Dark Green and Olive:

Bright green shades are produced with combinations of

Diamine Sky Blue FF or
Oxy Diamine Blue PG and
Thioflavine S,

or in superior fastness to light with

Diamine Fast Blue FFG and
Diamine Fast Yellow FF,

topped if necessary with

Brilliant Green Crystals Extra and
Thioflavine T.

For Dark Green:

Diamine Green G, B, CL
Diamine Dark Green N;

for saddening:

Oxy Diamine Black JE, JEI
Diamine Black HW;

for topping:

Brilliant Green Crystals Extra and
Solid Green Crystals O.

Olive Shades are produced with combinations of
Diamine Green B, G or
Diamine Dark Green N with
Diamine Brown 3G
Diamine Catechine G
Diamine Fast Yellow B or
Diamine Yellow CP,

topped if necessary with
Brilliant Green, in combination with
Chrysoïdine or
Thioflavine T;

combinations of the following yield shades of better fastness to light:
*Diamine Fast Blue FFB
*Diamine Fast Yellow B, FF
Diamine Yellow CP
*Diamine Fast Orange ER, EG.

Dark green and olive shades of very good fastness to washing and light may also be produced with
*Diamine Nitrazol Green GF, S, BB,
coupled with Nitrazol CF
or Paranitraniline C.

Brown:

For bright shades:
*Diamine Fast Brown G, R, GB
Diamine Catechine G, 3G
Diamine Brown 3G, 5G, R
Oxy Diamine Brown G, 3GN, RN.

For dark Browns:
Diamine Brown GG, M, MR, B, S
Diamine Catechine B
Cotton Dark Brown BM, BB
Oxy Diamine Brown KBS;

for saddening:
Diamine Black BH
Diamine Dark Blue B
Oxy Diamine Black JEI, JB;

or for producing shades of superior fastness to light:
Diamine Fast Blue FFB.

The following dyestuffs yield brown shades of very good fastness to washing, and may be used as substitutes for Cutch:

*Diamineral Brown G
Oxy Diamine Brown 3GN
Diamine Catechine 3G, G, B
*Diamine Brown M, B

} aftertreated with bichrome and copper sulphate.

For saddening:

Diamineral Blue R, B.

The following products, coupled with Nitrazol CF or Paranitraniline C yield likewise full brown shades of very good fastness to washing:

Diamine Nitrazol Brown B, BD, RD, T
Diamine Brown MR
Oxy Diamine Brown G, RN.

Grey and Mode Shades:

For Grey:

Diamine Grey G
Diamine Fast Grey BN*, RN
*Diamine Fast Black X, F
Diamine Dark Blue B.

For Mode Shades, combinations of the following products yield the best results:

Diamine Dark Blue B or
*Diaminogene extra with
Diamine Catechine B and
*Diamine Fast Yellow B;

shades of better fastness to light are obtained with combinations of

*Diamine Fast Blue FFB
*Diamine Fast Grey BN
*Diamine Fast Brown R
*Diamine Fast Orange ER
*Diamine Fast Yellow B.

Violet and Prune:

For bright violet shades:

*Diamine Fast Violet BBN
Diamine Brilliant Violet RR, B
Diamine Violet N, BB.

For Prune,

Diamine Heliotrope G, B, O
Oxy Diamine Violet B, G, R, BF

are used, and for saddening, the various

Oxy Diamine Black brands or
Diamine Black BH.

Any of the Methyl Violet brands or Tannin Heliotrope may be used for brightening or topping.

Black:

The various Oxy Diamine Blacks, and in particular

Oxy Diamine Black D, AT, BG, AM, FFC, JE, JEI, JB, JW, JWF
Para Diamine Black BF, FF, FFD extra conc.

are suited for cheap one-bath blacks.

Blacks of better fastness to light are obtained with

Diamine Fast Black F, X, XN extra conc.

Very full blacks of good fastness to washing, and especially well suited for hosiery and knit goods, are produced with

Diamine Black BH, DB
Diaminogene B
Diamine Neron BB
Oxy Diaminogene OB, OT, FFN

diazotised and developed with Phenylene Diamine, Blue-blacks being obtained by developing with Beta Naphtol.

Directions for Dyeing with Diamine Colours.

Light shades are best dyed with 1% soda ash and 5% soap, medium shades with about 10%, deep shades with 20—30%, Glauber's salt crystals and ½—1% soda ash; dye for about 1 hour in a boiling bath, cooling off somewhat towards the close of the dyeing process. The liquor should be rather concentrated for deep shades, and may be preserved for dyeing further lots. After dyeing, the goods are rinsed cold. Blacks are to advantage soaped warm with the addition of some oil (4 oz soap and 1½ oz oil per 10 gallons), or lightly starched.

An aftertreatment with bichrome and copper sulphate, or diazotising and developing, or coupling with Nitrazol CF or Paranitraniline C, serve with some dyestuffs for producing shades of very good resistance to washing such as are required for instance for linen goods or cotton hose.

Aftertreatment with Bichrome and Copper Sulphate.

The aftertreatment with chrome and copper is carried out for ¼ hour in a bath of about 80° C. (175° F.) with the addition of

1.5—2% bichrome
1.5—2% copper sulphate and
3 —5% acetic acid.

Diazotising and Developing.

The goods dyed as above stated and then thoroughly rinsed are treated for 10 to 15 minutes in a cold and fairly concentrated bath with

3% nitrite of soda and
9% hypochloric acid,

a wooden vessel being best used for this purpose and care being taken that the goods are not exposed to direct sunlight. They are then rinsed without delay in cold water, developed for 10 to 15 minutes in a fresh, cold, concentrated bath, rinsed thoroughly, and soaped.

Jet Black is developed with

0.8% Phenylene Diamine Powder,

calculated on the weight of the dyed goods, which is dissolved in hot water free from lime, 2% soda ash being besides added to the bath.

For the developing of Red and Claret from

Primuline
Diamine Azo Scarlet
Diamine Azo Bordeaux,

and of Blue, Dark Blue and Blue-Black from

*Diaminogene Blue NA, NB, BB
*Diaminogene Sky Blue N, 3B
Diamine Black BH
*Diaminogene B
*Diamine Neron BB
Oxy Diaminogene OB*, OT, FFN*,

1% Beta Naphtol

is used, calculated on the weight of the dyed goods, dissolved in hot water with its own weight of caustic soda lye of 77° Tw.

Coupling with Nitrazol CF or Paranitraniline C.

The coupling is carried out by working the dyed and rinsed goods for 10 to 15 minutes in a short cold bath charged with Nitrazol CF or diazotised Paranitraniline C, soda and acetate of soda, and then rinsing thoroughly.

a) Coupling with Nitrazol CF.

For 100 lbs Goods:

for 1½—2% shades:	for 3—4% shades:
2 lbs Nitrazol CF	3 —4 lbs Nitrazol CF
3 oz soda ash	5 —6½ oz soda ash
1½ oz acetate of soda	1½—2 oz acetate of soda.

To dissolve the Nitrazol CF, it should be stirred up with a little cold water, any lumps being carefully crushed, and is brought into complete solution by pouring a sufficient quantity of cold water over it. It is then added to the bath through a cloth or sieve.

b) Coupling with Paranitraniline C.

For 100 lbs Goods:

for 1½—2% shades:	for 3—4% shades:
3½ gallons diazotised Paranitraniline C	5—7 gallons diazotised Paranitraniline C
8 oz soda ash	¾—1 lb soda ash
3 oz acetate of soda	5—6½ oz acetate of soda.

The solution of diazotised Paranitraniline C is prepared as indicated on page 24.

Small quantities of Basic Colours may be added direct to the coupling bath for brightening or shading purposes, for instance for Black 0.2—0.3% Methylene Blue BB.

Topping Diamine Colours with Basic Colours.

The topping of shades produced with Diamine Colours is always carried out in a fresh bath with the addition of 5—10% acetic acid or 3—5% alum; commence cold, and gradually raise the temperature to 50—60° C. (120—140° F.). Basic Colours dye on a bottom of Diamine Colours without any mordant, and are fixed fairly fast if used in moderate quantities, that is to say, in quantities not exceeding one-fifth the weight of the Diamine Colours employed; they should be used solely for brightening the shades, and in most cases effect an enhancement of the fastness to light.

B. DYEING WITH IMMEDIAL COLOURS.

Immedial Colours are used especially for producing shades of excellent fastness to washing and light, which are however not very often required in garment dyeing; as a rule they will only interest garment dyers for producing fast shades of Black, Brown, Blue and Green on hosiery, knit goods, linen cloth, etc.

The following products are especially well suited for garment dyeing:

For Blue and Dark Blue:

For pure light blue shades:
Immedial Indone 3B conc.
Immedial Indogene GCL conc.

For medium Blues:
Immedial Indone BF conc., R conc.
Immedial Indogene B conc.

For Dark Blues:
Immedial Direct Blue B extra conc.,
BB extra conc., 4B extra conc.

Brown and Mode Shades:

For bright Browns:

Immedial Cutch O, G, BG, BGG;

for Dark Browns:

Immedial Brown B, BR, W conc.
Immedial Dark Brown A
Immedial Dark Brown D conc.

Mode colours are obtained by dyeing light shades of the afore-named products.

Green and Olive:

For bright green shades:

Immedial Brilliant Green G extra
Immedial Green BB extra, GG extra;

for Dark Green:

Immedial Deep Green G;

for Olive:

Immedial Olive GG, 3G
Immedial Yellow Olive G, 5G.

Black:

for greenish deep Blacks:

Immedial Black NNG conc.
Immedial Carbon B;

for Blue-Black:

Immedial Black NBB conc.
Immedial Brilliant Carbon FB;

for Jet Black:

Immedial Black NNR conc.
Immedial Carbon R.

Directions for Dyeing with Immedial Colours.

As a general rule, the Immedial Colours are dyed in exactly the same way as the Diamine Colours, but when the dyeing is complete the dye-liquor has to be removed as quickly as possible by pressing off or by

wringing, the goods being then immediately entered into a rinsing bath. The dye-vessels should best be of wood or of iron; vessels or fittings of copper or brass must not be used in the dyeing. As a rule, the dyeing takes place at the boil; the dyebaths should be kept as short as possible, and as they do not become exhausted, be preserved for further use.

The Immedial Colours are dissolved boiling hot with the addition of sodium sulphide, an equal weight of sodium sulphide crystals as of dyestuff being as a rule used; the following dyestuffs are exceptions:

Immedial Indogene GCL conc.
Immedial Indone 3B conc., BF conc., R conc.
Immedial Direct Blue B extra conc.,
BB extra conc., 4B extra conc.
Immedial Brilliant Carbon FB
Immedial Carbon B, R,

in the dissolving of which about double their weight of sodium sulphide is required.

The dyebath is charged with 8 oz soda ash and 1—2 lbs common salt per 10 gallons in addition to the dyestuff dissolved with sodium sulphide.

A dyebath for dyeing 10 lbs of stockings black may for instance be charged as follows:

30 gallons water
1½ lbs Immedial Black NNG conc.
1½ ,, sodium sulphide crystals
1½ ,, soda ash
6 ,, common salt.

Raise the bath to the boil, enter the material, and work for one hour, taking care that the goods are exposed to the air as little as possible. Then squeeze them off by means of a wringing machine attached to the dye-box and provided with india-rubber rollers, and run into a cold rinsing bath standing ready, charged with about 3 oz soda per 10 gallons. The goods are worked well in this bath,

and wrung off quickly, the rinsing being then completed in two more warm baths; finally the goods are soaped hot.

Brown, Dark Blue and Olive are dyed in the same manner as Black. In the case of light and medium Blues it is better to work at a temperature of only 50—60° C. (120—140° F.) brighter shades being thereby obtained.

C. DYEING WITH HYDRON COLOURS.

The Hydron Colours are used for the production of dyeings of exceedingly good fastness to washing, light and wear, as well as of shades fast to bleaching, on cotton or linen. They are vat dyestuffs which are dyed with the addition of hydrosulphite and caustic soda lye, sodium sulphide being also used for some of the brands. The method of working generally speaking is about the same as customary for Immedial Colours. The application of the Hydron Colours will principally extend generally to the dyeing of stockings, hosiery goods and linen and cotton cloth if the requirements for fastness are very exacting.

Of Hydron Colours, the following brands are on the market:

Hydron Blue G paste 20%, 30%, 40%
Hydron Blue G powder
Hydron Blue B paste 20%, 30%, 40%
Hydron Blue B powder
Hydron Blue R paste 20%, 30%, 40%
Hydron Blue R powder
Hydron Dark Blue G paste 20%, 40%
Hydron Dark Blue G powder
Hydron Violet B paste 20%, 40%
Hydron Violet B powder

Hydron Violet R 20% and 40% paste
Hydron Violet R powder
Hydron Olive G 40% paste
Hydron Olive G powder
Hydron Olive B 40% paste
Hydron Olive B powder
Hydron Brown OG powder
Hydron Brown OB powder
Hydron Yellow G 20% paste.

Directions for Dissolving Hydron Colours.

Paste Products: The Hydron Blue and Hydron Violet brands in paste form may be added straight to the dyebath. The dyestuff mixed with warm water is added to the warm bath together with the requisite quantities of alkali, whereupon the sodium sulphide and hydrosulphite are added whilst stirring. After the addition of the hydrosulphite the dyestuff dissolves quickly.

Hydron Yellow Paste and Hydron Olive Paste are diluted with about 5 to 10 times their weight of water free from lime, then reduced, and dissolved by adding the quantity of hydrosulphite and lye requisite for the dyeing.

Powder Products: The dyestuff is mixed to an even paste with about one-half or the same quantity of cold to lukewarm water free from lime. There should further be added about ½ gallon methylated spirits per 1 gallon water for the purpose of a quicker and more even mixing, especially in the case of Hydron Blue and Hydron Violet. The paste thus obtained is diluted with about ten times its weight of cold water.

The Hydron Blues and Hydron Violets may then be added straightaway to the dyebath; the other products, however, after having been made into a paste, are mixed with the quantity of hydrosulphite and caustic soda lye necessary for dissolving, being thus brought into solution.

Directions for Dyeing with Hydron Colours.

Hydron Colours are best dyed in wooden or iron vessels, to which is attached a wringing machine with india-rubber rollers so that the dyed material may be squeezed off very well.

The proportions of dyestuff, hydrosulphite, caustic soda lye etc. will be found in the directions given below, all of which will be of sufficient guidance for dyeing medium shades.

Hydron Blue G, B or R Paste 20%.

Dyestuff	20%
Sodium sulphide crystals	20%
Caustic soda lye 77° Tw.	10%
Hydrosulphite conc. powder	4—5%

First treat the well boiled goods for about ½ hour in a boiling hot dyebath charged with the dyestuff and the requisite quantities of sodium sulphide and caustic soda lye, allow the bath to cool down to 50—60° C. (120—140° F.), and add the hydrosulphite. The bath should then have a completely yellow appearance. Treat the goods for another ½ hour or so, squeeze off well with the india-rubber rollers, run straight into a bath of lukewarm water charged with a little soda, and rinse therein without allowing them to come much into contact with the air. Hereafter complete the rinsing in two fresh rinsing baths.

Brighter shades are obtained by aftertreating the goods for ½ hour with 1—2% perborate at 50—60° C. (120—140° F.) after completion of the rinsing, and by then rinsing once more.

Hydron Dark Blue G Paste 20%

is dyed in exactly the same way as Hydron Blue Paste 20%, but the quantities of caustic soda lye are to advantage increased by about one-tenth to one-fifth.

Hydron Violet B and R Paste 20%.

These dyestuffs are applied according to the same directions as Hydron Blue Paste 20%, but it is recommended to add about one-tenth to one-fifth more hydrosulphite than needed for Hydron Blue. The working is just the same as with Hydron Blue, and in order to increase the brightness of shade the dyeings after being rinsed are soaped boiling hot.

Hydron Olive G and B Powder.
Hydron Brown OG and OB Powder.

Dyestuff in Powder	4%
Caustic soda lye 77° Tw.	16%
Hydrosulphite conc. Powder	8%

Reduce the dyestuff with the requisite quantities of hydrosulphite and caustic soda lye, and ten times the weight of water, at 70—80° C. (160—175° F.), add the reduced solution to the dyebath at about 50° C. (120° F.), to which a small amount of hydrosulphite and lye have previously been added. Work for about one hour in this bath, squeeze off, and rinse. In the case of Hydron Brown and Hydron Olive, somewhat brighter shades are obtained by soaping boiling hot.

Hydron Yellow G Paste 20%.

Dyestuff	15%
Caustic soda lye 77° Tw.	12%
Hydrosulphite conc. powder	5%
Common salt	2 lbs per 10 gallons.

After reducing the dyestuff with the addition of hydrosulphite and caustic soda lye in about ten times its weight of water at 30—40° C. (85—105° F.), add the solution at 30° C. (85° F.) to the dyebath previously prepared with a little hydrosulphite and caustic soda lye, then add the common salt, and dye for ½ to 1 hour. Hereafter squeeze off, age for 1 to 2 hours, and rinse.

D. DYEING WITH BASIC COLOURS.

These are used particularly for the production of specially bright shades.

For Rose, Red, Claret:

Irisamine G
Rosazeïne 6G
Safranine } all brands
Magenta }
Scarlet for cotton
Cerise Ia, N
Russian Red B, G
Geranium GN.

Blue and Dark Blue:

New Methylene Blue, all brands
Indazine M
New Blue B, BF, D 120
Naphtindone BB.

Yellow, Orange, Brown:

Thioflavine T, TCN
Paraphosphine GG, G, R
Tannin Orange R, GG
Chrysoïdine } all brands.
Bismarck Brown }

Green:

Brilliant Green Crystals extra
Solid Green Crystals O.

Violet:

Tannin Heliotrope } all brands
Methyl Violet }
Crystal Violet 5B bluish, 10B.

Dyeing Directions for Basic Colours.

After cleaning and bleaching well, mordant, in the case of bright shades, for several hours, in a warm bath with 2—5% tannic acid, according to the depth of shade to be produced, then treat for ½ hour with 1—3% antimony salt in a cold bath, and rinse; light shades require less heavy tannin mordanting than dark ones. By mordanting too strongly, unsatisfactory penetration and uneven shades result.

When mordanting and dyeing light shades, the goods must on no account come into contact with articles made of iron. For less bright shades, leaf sumac may be used in the place of tannic acid or sumac extract, 4 to 8 times the quantity of leaf sumac being required as of tannic acid or sumac extract. For deep shades, antimony salt is substituted by baths of 1½—3° Tw. of pyrolignite of iron or nitrate of iron, by means of which a lighter or darker grey ground is obtained, upon which the Basic Colours likewise become well fixed.

Commence dyeing cold; add a little acetic acid (5%) or alum (3—5%) to the dyebath as well as the dyestuff well dissolved, in several portions, work quickly, and heat to 50—60° C. (120—140° F.), but only when the bath is practically exhausted.

When the cotton portion of half-wool or half-silk goods, the wool or silk portion of which has been dyed with Acid or Basic Colours, is to be dyed with Basic Colours, the goods are only mordanted cold, with a somewhat stronger mordant of tannic acid or sumac than used for all-cotton goods; the other manipulations are the same as described above. The dyeing however must be carried out afterwards cold, at all events not at a higher temperature than 40° C. (105° F.) so as to not have the wool or cotton absorb too much dyestuff. If this occurs in spite of all precautions, it is advisable to strip the goods lightly in dilute hydrochloric acid, or to soap lukewarm, or wash in a decoction of Panama bark.

DYEING OF LINEN AND HALF-LINEN.

The preparation for dyeing is about the same as for cotton, a thorough boiling with soda being thus sufficient; for light shades bleaching with chlorine is needed.

The dyeing is generally carried out according to the same methods and with the same dyestuffs as for cotton, but Diamine, Immedial and Hydron Colours are employed almost exclusively for these materials, Basic Colours being used only in very small quantities for topping and brightening.

In view of the fact that shades of good fastness to washing and light are almost invariably demanded for linen and half-linen goods, the following Diamine Colour brands are particularly to be recommended:

For Blue:

Diamine Fast Blue, all brands
Diamine Sky Blue FF, Diamine Blue RW — aftertreated with copper sulphate
Diamineral Blue CV, R, B; Diamineral Brilliant Blue B; Diamine Dark Blue B — aftertreated with chrome and copper
Diaminogene Blue BB, NB, NA — developed with Beta Naphtol.

For topping:

New Methylene Blue GG, N, R;

for Red and Claret:

Diamine Fast Red F, 8BL
Diamine Fast Scarlet L3B, L4G
Diamine Fast Bordeaux 6BS;

for Yellow and Orange:

Diamine Fast Yellow B, FF
Diamine Fast Orange EG, ER;

for Violet:

Diamine Fast Violet BBN;

for Brown:

Diamine Fast Brown G, R, GB
Diamineral Brown G
Oxydiamine Brown 3GN
Diamine Brown 3G, R, M
Diamine Catechine G, B
} aftertreated with chrome and copper;

for Green:

Diamine Green G, aftertreated with chromium fluoride, or,

combinations of

Diamine Blue RW
Diamine Sky Blue FF
Diamine Fast Yellow B
} aftertreated with copper sulphate

Diamine Nitrazol Green GF, S, BB, coupled with Nitrazol CF;

for Black:

Diamine Fast Black X, F, XN extra conc.
Oxydiaminogene OB, OT, FFN
Diamine Neron BB
Diaminogene B
Diamine Black BH, DN
} developed with Phenylene Diamine Powder.

The Diamine Colours are best dyed with the addition of soda and a little Turkey-red oil, salt being omitted at the beginning, by which means a better penetration is obtained on the frequently very hard linen fibre; Glauber's salt or common salt are only added when this result has been ensured.

Any of the Immedial Colours mentioned on pages 80 and 81 are suitable for this purpose. These too are dyed without salt to commence with, but with somewhat increased quantities of sodium sulphide and with 3—4½ oz Turkey-red oil per 10 gallons liquor, salt being added only when sufficient penetration has been ensured.

The Hydron Colours mentioned on pages 83—86 are likewise exceedingly well suited for the dyeing of linen, being applied in the same way as for cotton, but to advantage with the addition of a little Turkey-red oil.

DYEING OF ARTIFICIAL SILK GOODS.

Artificial silk is being used very largely nowadays in the production of braids, lace and other articles used for dress trimmings.

Artificial silk (or "Art Silk") is divided into three separate groups according to the methods followed in their manufacture, viz: Chardonnet Silk (also called Frankfort Artificial Silk, Nitro Silk, Besançon Silk, Tubize Silk), Glanzstoff (also called Elberfeld Artificial Silk) and the so-called Viscose Silk, which behaves similarly to Glanzstoff.

Chardonnet Silk possesses a marked affinity for Basic Colours, and can thus be dyed straightaway with the addition of a little acetic acid if no special fastness is required. Diamine Colours likewise go on to this fibre, but somewhat more slowly, so that it is necessary to charge the dyebaths with rather larger quantities of dyestuff.

Glanzstoff behaves on the whole like cotton, Diamine Colours thus coming mainly into consideration for the dyeing; Basic Colours can be dyed on Glanzstoff without any mordant, but only in light shades.

Viscose Silk possesses practically the same properties as Glanzstoff, except that it has a somewhat greater affinity for Basic Colours.

In the dyeing, care has to be taken that the temperature is not too high and at all events does not exceed 70° C. (160° F.). It is moreover necessary to treat the material with the utmost care in the dyeing, artificial silk when in a damp state being very sensitive and apt to tear. The use of strong alkaline or acid baths should likewise be avoided.

It being a relatively difficult matter to distinguish the afore-named different qualities of artificial silk on goods which have been dyed previously, as often occurs in garment dyeing, the best way, if the origin of the material is not known, should be to work first with Diamine Colours and to use Basic Colours only for topping or for the production of very bright shades.

If Diamine Colours are found not to work properly on to the fibre, Basic Colours should be used by themselves, the material if necessary being mordanted beforehand with tannin and antimony.

A. DYEING WITH DIAMINE COLOURS.

The following dyestuffs may be used:

Pink, Red and Claret:

Diamine Rose BD, GD
Diamine Red 4B, 6B, 10B
Diamine Purpurine B, 3B, 6B
Diamine Fast Scarlet GFF, 4BFF, 5BFF, 7BFF, 8BF, 10BF
Diamine Fast Red F, 8BL
Diamine Fast Bordeaux 6BS
Diamine Bordeaux B, VRO
Diamine Brilliant Bordeaux R.

Blue and Navy Blue:

Diamine Sky Blue, FF
Diamine Blue BX, 2B, 3B, RW
Diamine Brilliant Blue G
Diamine Fast Blue FFB, FFG, BN
Oxydiamine Blue, all brands
Diamineral Blue CV, CVB, 3RC
Diamine Dark Blue B
Diamine Black BH.

Yellow and Orange:

Thioflavine S
Oxydiamine Yellow TZ
Diamine Fast Yellow B, FF, M, A
Diamine Yellow CP
Diamine Fast Orange EG, ER
Oxydiamine Orange G, R
Diamine Orange F.

Green:

Diamine Green B, G, FG, CL
Diamine Dark Green N.

Brown:

Diamine Brown M, R, GG, No. 30a
Diamine Bronze Brown PE
Diamine Catechine G, 3G
Oxydiamine Brown RN, 3GN, G
Diamine Fast Brown G, R.

Violet:

Diamine Fast Violet BBN
Diamine Brilliant Violet B, RR
Diamine Violet N, BB
Diamine Heliotrope B, O, G
Oxydiamine Violet B, G, R, BF.

Grey and Mode Colours:

Diamine Fast Grey BN
Diamine Grey G

For mode colours, these are used in combination with

Diamine Bronze Brown PE
Oxydiamine Brown G, RN
Diamine Yellow CP.

Black:

Black for Artificial Silk GL
Oxydiamine Black JE, JEI, JB, JW
Diamine Fast Black F, X, XN extra conc.
Diaminogene B } diazotised and developed with Phenylene Diamine powder.
Oxydiaminogene EM, FFN }

Directions for Dyeing with Diamine Colours.

For artificial silk goods, Diamine Colours are applied to best advantage at a temperature of 50—70° C. (120—160° F.) with the addition of ½—1% soda ash and 1—2% Turkey-red oil or monosolvol; for deep shades up to 10% Glauber's salt may further be added.

For certain particularly bright shades, the goods may be topped with Basic Colours in a cold to lukewarm acetic acid bath; for this purpose any of the products mentioned on pages 87 and 88 are suited.

B. DYEING WITH BASIC COLOURS.

Any of the Basic Colours mentioned on pages 87 and 88 may be used. For Blacks,

Black for Artificial Silk BN, GN, 3GN, TN

come principally into consideration.

The goods are dyed in a lukewarm bath with the addition of about 5% acetic acid; if the dyestuffs will not go properly on to the fibre, it is advisable in the case of full shades to mordant the material previously with tannin and antimony in the same way as cotton.

DYEING OF CHINA-GRASS, KAPOK AND SOLIDONIA FIBRE.

The fibre of *China-grass* (ramie) behaves similarly to cotton, so that the directions given for cotton apply equally for the dyeing of China-grass. As a general rule, clear white material is used which does not require any further bleaching but merely wetting out in a hot soda bath before dyeing.

For the dyeing of *Kapok*, some of the Diamine Colours and all of the Immedial and Basic Colours are suited. The Basic Colours may be applied without mordanting the material previously. When dyeing with Diamine and Immedial Colours the addition of soda should be reduced to a minimum, because alkali affects the lustre of the fibre. On the other hand double the amount of salt should be added as for cotton, as Kapok absorbs dyestuff with difficulty. On an average 40—50% more dyestuff will be required than is necessary to dye the same depth of shade on cotton.

Kapok is merely boiled in plain water before the dyeing; in the case of light shades it is best to bleach with hypochlorite of soda of ¾ Tw. without previously boiling with alkalies.

Of the Diamine Colours, the following are the most suitable for Kapok:

Diamine Fast Yellow, all brands	Diamine Scarlet 3B
Diamine Fast Blue FFB	Diamine Brilliant Bordeaux R
Diamine Fast Orange ER, EG	Diamine Brown GG, 3G
Diamine Fast Brown R, G	Diamine Sky Blue FF
Oxydiamine Yellow TZ	Diamine Green CL
Diamine Red 4B	Diamine Black BH

Diamine Nitrazol Green GF, Diamine Nitrazol Brown T } coupled with Nitrazol CF

Diaminogene B, Oxydiaminogene FFN } diazotised and developed with Phenylene Diamine powder.

Solidonia Fibre behaves similarly to China-grass and like the latter may be dyed in the same way as cotton.

DYEING OF JUTE AND COCOA-NUT FIBRE.

All the treatment necessary previous to the dyeing is to steep the material in boiling water or in a hot soda solution (approximately 8 oz per 10 gallons liquor). A lighter ground shade is obtained by subsequently souring off with bisulphite and hydrochloric acid. If bleaching is necessary, this is done according to the particulars on page 134.

For Dyeing,

a) Basic Colours
b) Acid Colours
c) Diamine Colours

may be used.

A. BASIC COLOURS.

The Basic Colours come into consideration for bright shades in particular, and are dyed without mordanting previously. As a rule the dyeing is done in a boiling hot to boiling bath with the addition of 2—5% acetic acid. If the goods are difficult to dye through, the quantity of acetic acid may be increased, and it is advisable moreover in such case to add the dyestuff in several portions and to prolong the time of boiling.

The following Basic Colours may be used:

Yellow and Orange:

Thioflavine T, TCN
Paraphosphine GG, G, R
Diamond Phosphine D, GG, PG, R
New Phosphine G
Tannin Orange R
Chrysoïdine, all brands.

Red and Claret:

Safranine } all brands
Magenta }
Tannin Heliotrope
Cerise Ia, N
Russian Red B, G
Irisamine G (for Rose).

Blue and Navy Blue:

New Methylene Blue N, R, 3R
Indazine M
New Blue B, R, D
Navy Blue 010650J.

Green:

Brilliant Green Crystals extra
Solid Green Crystals O.

Violet:

Methyl Violet, all brands
Crystal Violet 10B.

Brown:

Bismarck Brown, all brands
Tannin Brown B
Piassava Brown KB.

Black:

Jute Black, all brands
Tannin Leather Black M.

B. ACID COLOURS.

Acid Colours are employed principally for producing bright shades of Scarlet, Red, Orange, Yellow, Blue, Green and Violet, and further for grey and mode shades on material difficult to penetrate.

The following are suited for

Yellow and Orange:

Indian Yellow G, R
Tropaeoline OO
Orange extra, EN
Acid Brown D.

Scarlet and Red:

Brilliant Croceïne, all brands
Cocoa-Nut Scarlet OEE
Roccelline.

Blue and Grey:

Pure soluble Blue
Water Blue B, R, RS
Formyl Blue B
Nigrosine soluble in Water
Aniline Grey B, R
Solid Blue R, 3R.

Green and Violet:

Brilliant Milling Green B
Formyl Violet S4B.

Dye boiling for 1 hour with the addition of about 5% alum and 10—20% Glauber's salt crystals, allow to cool off in the bath for ½ hour, then dry without rinsing.

C. DIAMINE COLOURS.

Diamine Colours may be applied for the production of every kind of shade; they offer the advantage of very good penetration and of yielding shades of good fastness to water and rubbing.

The following are suited for

Yellow and Orange:

Diamine Fast Yellow B, FF, M
Diamine Yellow CP
Diamine Orange B, F
Diamine Fast Orange EG, ER
Oxydiamine Orange G, R.

Red and Claret:

Diamine Red 4B, 6B, 10B
Diamine Purpurine B, 3B, 6B, V
Diamine Violet Red
Diamine Bordeaux B, S, BR, VRO
Diamine Fast Bordeaux 6BS
Diamine Brilliant Bordeaux R.

Blue:

Diamine Sky Blue, FF
Diamine Pure Blue A
Oxydiamine Blue B, G, 3G, 5G
Diamine Azo Blue No. 51, 54
Diamine Steel Blue L
Diamine Fast Blue FFB
Diamine Fast Brilliant Blue R
Diamine Dark Blue B
Diamine Black BH.

Green:

Diamine Green B, G, CL, FG
Diamine Dark Green N.

Violet:

Diamine Violet N
Diamine Fast Violet FFBN, FFRN
Diamine Brilliant Violet B, RR
Oxydiamine Violet B, G, R.

Brown:

Diamine Brown 3G, M, R, MR
Diamine Fast Brown G, R
Oxydiamine Brown G, RN, 3GN
Diamine Catechine G, B
Cotton Brown N
Cotton Dark Brown BM.

Grey and Black:

Diamine Fast Grey BN
Diamine Fast Black C high conc., CB high conc.
Oxydiamine Black JE, JEI, JB, JW.

Dye boiling for about 1 hour with the addition of 5—20% Glauber's salt crystals and ½ to 1% soda ash in as short a liquor as possible.

DYEING WATERPROOF COATS BLACK.

Great care must always be exercised in re-dyeing waterproof coats. Both the textile and rubber portion should be in a perfectly sound condition so as to withstand high temperature or treatment in a wet state; articles not corresponding to these conditions should be rejected.

Rubber-proofed *cotton* goods are best dyed black with Diamine Black DN in a cold to lukewarm bath, being shaded if necessary with some Diamine Fast Yellow A or Diamine Orange D. Work for 1 hour in a bath charged with 4—8 oz dyestuff, 1—2 lbs Glauber's salt crystals and ¾ oz soda ash per 10 gallons liquor, at a temperature of 30—40° C. (85—105° F.), then rinse cold, and dry at a low temperature.

In view of the fact that for *all-wool* or *half-wool* rubber-proofed fabrics, prolonged boiling such as is necessary as a rule for dyeing the wool has to be avoided, it is an advantage to increase the affinity of the wool for the dyestuff by chloring the goods. For this purpose treat the material to be dyed for ¼ hour in a cold bath charged with 1—1½ parts hydrochloric acid per 100 parts liquor; then allow the goods to drain off well, enter into a cold chloride of lime bath of 0.4—0.7° Tw., work therein for about ½ hour, enter again into the old hydrochloric acid bath for another ¼ hour, and finally rinse well in cold and lukewarm water.

All-wool rubber-proofed goods are dyed in a bath heated to 60—70° C. (140—160° F.) charged with 1½—3 oz Naphtylamine Black 4B per 10 gallons liquor, without any other ingredients. Half-wool rubber-proofed goods are dyed for one hour, likewise at 60—70° C. (140—160° F.), with 3—4½ oz Oxydiamine Black JB and 1—2 lbs Glauber's salt crystals per 10 gallons liquor.

DRY-DYEING.

Dry-dyeing is the method of dyeing avoiding the use of the customary aqueous colour solutions, and thus comes mainly into consideration for articles which are likely to suffer in their structure or condition through the action of water.

The colour solutions (i. e. dyebaths) may be prepared with

a) alcohol
b) benzine or benzol
c) carbon tetrachloride, tetrachlorethane etc.

A. DYEING IN ALCOHOLIC SOLUTIONS.

This method is employed to a limited extent only, and is resorted to chiefly for hat braids and made-up hats consisting of artificial silk, artificial horsehair, strongly polished yarns, etc. The following dyestuffs, which are soluble in alcohol, may be used for this purpose:

for Yellow and Orange:

Auramine O
Thioflavine T, TCN
Chrysoïdine Crystals;

for Rose and Red:

Irisamine G extra
Safranine S No 150
Magenta Ia. Dia.
Cerise Ia, N;

for Violet:

Methyl Violet, all brands
Crystal Violet 10B
Tannin Heliotrope;

for Blue:

Spirit Blue B, R
Victoria Blue B
New Methylene Blue GG
Indazine soluble in spirits;

for Green:

Brilliant Green Crystals extra
Solid Green Crystals O;

for Grey and Black:

Lake Black C
Nigrosine soluble in spirits.

Of these dyestuffs, 1—2 lbs are dissolved in 10 gallons alcohol. This solution is heated a little, filtered, and then diluted as required. Some shellac or varnish are frequently added to the colour solution, especially in the case of black or dense shades; for Spirit Blue, Victoria Blue and Nigrosine it is an advantage to add 1—2% glacial acetic acid, calculated on the quantity of alcohol. The solutions should be applied very evenly, best by means of a brush, or by means of the well-known spraying process. The material is best dried by being moved quickly to and fro in a moderately warm room.

B. DYEING IN BENZINE OR BENZENE.

For this process, either dyestuffs may be used which are soluble straightaway in benzine or benzene, or such as are dissolved with alcohol and made soluble in a benzine or benzene bath by an addition of saponine (benzine soap).

The following products are soluble straightaway in benzine or benzol:

Cerasine Yellow I	Cerasine Blue I
Cerasine Orange G	Cerasine Violet I
Cerasine Rose I	Benzine Blue I.
Cerasine Red II	

These products become dissolved in the proportion of 1—2 lbs per 10 gallons of benzine, or better still of benzene, or in a mixture of equal parts benzine or benzene. In dissolving, it is an advantage to heat to 40° C. (105° F.); the solutions are filtered, and added to the benzine and benzene baths, in which the goods to be dyed are worked rapidly, and then hydroextracted. An addition of 3—5% glacial acetic acid, calculated on the volume of the dyebath, effects a very good exhaustion of the dyestuffs and besides increases their fastness to light.

Deeper and faster shades are obtained by the second process, by using dyestuffs soluble in alcohol, preferably Acid Colours. This process is based on Farrell & May's report in the "Journal of the Society of Dyers and Colourists", 1909, No 2; the following dyestuffs may be used for working according to this process:

For Yellow and Orange:

Yellow KTC No 1, No 2
Orange KTC No 3;

for Rose and Red:

Rosazeïne B
Eosine Scarlet B 140
Red KTC No 6, No 7;

for Blue and Dark Blue:

Blue KTC No 9, No 10
Dark Blue KTC No 13, No 14;

for Green:

Green KTC No 12;

for Violet:

Violet KTC No 8;

for Brown:

Brown KTC No 4 and No 5;

for Black:

Black KTC No 16 and No 17.

Dissolve 1—2 lbs of any of these dyestuffs per 10 gallons alcohol as pure as possible, without making the solutions too concentrated.

The dyestuff solutions are filtered, and whilst stirring well are entered into 3 to 4 times the quantity of a 25 percent solution of saponine (benzine soap) in benzine. The stock solution prepared in this manner is then added to the dyebath prepared with a solution of about 10% benzine-saponine. It is essential that the latter is perfectly clear and does not contain any precipitate.

The goods to be dyed should first of all be cleaned well by means of benzine or benzine soap; they are then entered into the dyebath slightly heated, worked for 1 to 4 hours, rinsed in pure benzine, and whizzed; it is an advantage to brighten the goods subsequently in a benzine bath containing 1—2% glacial acetic acid.

The dyebaths do not exhaust, and may be preserved for dyeing subsequent lots.

In addition to the above-mentioned Acid Colours, the Basic Colours enumerated on pages 102 and 103 may be used, which are however inferior in point of fastness to light.

C. DYEING IN CARBON TETRACHLORIDE, TETRACHLORETHANE ETC.

(British Patent No 22876/10).

These products, which are now frequently used in the place of benzine for dry-cleaning, may to advantage also be used for dry-dyeing according to the process protected to us by patent. Although there are no dyestuffs directly soluble in carbon tetrachloride, quite a number of dyestuffs may be dissolved first in alcohol, with or without the addition of formic acid, acetic acid, acetic anhydride, lactic acid, being then dyed in a bath of carbon tetrachloride; in special cases an addition of saponine (benzine soap) is advantageous. The shades obtained are distinguished by great body of shade, covering power and fastness to light, and are in no way inferior to the shades produced by the ordinary wet process; blacks and deep shades may likewise be dyed easily in this manner, very good results being obtained particularly on wool or silk.

The names of the dyestuffs suitable for the process mentioned, and the directions for dissolving and dyeing, are given on the table on the opposite page.

The dyestuffs are dissolved hot in alcohol of about 96 percent or in a mixture of 90 parts alcohol and 10 parts formic acid 85%, and filtered carefully; the dyestuff solution when still warm is then diluted at about 30° C. (85° F.) with double the quantity of carbon tetrachloride or a solution of 90 parts carbon tetrachloride and 10 parts saponine (benzine soap). For certain dyestuffs, it is necessary further to add some formic acid 85% as is shown in the table, and the dyebath prepared in this manner is then filtered again. If in certain cases precipitations take place in the baths, especially when using too hydrous alcohol, this drawback may be overcome by adding further small quantities of alcohol.

The dyebaths should at all times be perfectly clear. The alcoholic solution should never be entered

Continued on page 108.

Dyestuffs	1 part dyestuff is dissolved in		The dyebath is prepared with			
	alcohol	90 parts alcohol 10 parts formic acid 85%	dyestuff solution	carbon-tetra chloride	90 parts carbon tetra-chloride 10 parts saponine	formic acid 85%
Yellow KTC No 1	100	—	35	65	—	—
Yellow KTC No 2	—	100	35	65	—	—
Orange KTC No 3	—	100	35	65	—	—
Brown KTC No 4	—	100	35	65	—	—
Brown KTC No 5	—	100	35	65	—	—
Red KTC No 6	—	100	35	65	—	—
Red KTC No 7	—	100	35	65	—	—
Violet KTC No 8	—	100	35	—	65	—
Blue KTC No 9	—	100	35	65	—	—
Blue KTC No 10	—	100	35	65	—	—
Blue KTC No 11	100	—	35	—	62	3
Green KTC No 12	—	100	35	65	—	—
Dark Blue KTC No 13	—	100	35	—	65	—
Dark Blue KTC No 14	100	—	35	—	62	3
Grey KTC No 15	—	100	35	—	65	—
Black KTC No 16	—	100	35	62	—	3
Black KTC No 17	—	100	35	62	—	3
Rosazeïne B extra	—	100	35	—	65	—
Irisamine G extra	—	100	35	65	—	—
Eosine Scarlet B 140	100	—	35	62	—	3
Magenta Dia. Ia.	—	100	35	—	65	—
Safranine S No 150	—	100	35	—	65	—
Methyl Violet BB 72 No 0	—	100	35	65	—	—
Thioflavine T 140	—	100	35	65	—	—
Bismarck Brown GG 125	—	100	35	65	—	—

into the carbon tetrachloride, but the latter always into the alcoholic solution. Dye at a temperature of 20—40° C. (68—105° F.), for ½ to 1 hour, to best advantage in closed vessels; by heating to higher temperatures the wool is dyed a considerably deeper shade than the silk or cotton.

After dyeing, the goods are freed by pressure and hydro-extraction from the excess dyeliquor, and rinsed if necessary in a fresh bath of carbon tetrachloride, hydro-extracted, and dried hot; dyeings which appear to be too strongly dyed or bronzy may be brightened in a bath of saponine and carbon tetrachloride or saponine and benzine.

The dyebaths do not exhaust completely, and may therefore be preserved for dyeing subsequent lots if protected from light; it is also possible by distilling at 70—80° C. (160—175° F.) to regenerate the mixture of alcohol and carbon tetrachloride. The carbon tetrachloride may be isolated therefrom by shaking with water, and the alcohol may then be regenerated by another distillation of the aqueous solution.

LEATHER DYEING.

Leather dyeing as ordinarily practised at leather factories is exhaustively dealt with and described in brochure No 3410, so that all that is necessary here is a reference thereto. In the following some of the methods which may be practised for the

RE-DYEING OF USED LEATHER GOODS

are described.

1. SHOES ETC.

Fancy-coloured shoes can only be dyed up with any ease to their original shade when the grain of the leather is still in an undamaged state. The operation is best carried out by first carefully cleaning the shoes with benzine or carbon tetrachloride, giving them a coating with a solution of 4—5 lbs shellac, 1—1½ lbs borax and 1½—3 oz soap per 10 gallons water which has been coloured with 1½—3 oz of an acid dyestuff suitable for the purpose.

The following Acid Colours come into consideration:

for Yellow and Brown:

Indian Yellow G
Acid Phosphine JO
Havana Brown S conc.
Fast Brown D;

for Red:

Roccelline
Amaranth

For shading or saddening,

Nerazine G and BR

are used.

If the leather shows small defects only, the same solution may be used, provided the shoes have been previously dressed with a starch paste of a moderately thick consistency or with a gelatine solution.

As a rule, however, worn shoes are too much damaged already to permit of their being re-dyed anything but black.

Before being re-dyed, the shoes are cleaned by freeing them from any adhering polish or cream, whereupon they are painted over with a brush either once or several times with a solution of a black dyestuff in alcohol or benzine.

The following dyestuffs are suited for alcoholic solutions:

Nigrosine soluble in spirits extra
Lake Black C, BE or N.

Benzine solutions are prepared by melting

1 part by weight of Nerazine Base B or BG with
3 parts by weight of stearic acid,

the benzine being added when the mass has cooled off.

In order to replace the grease removed from the leather by the cleaning process, 5—10% castor oil are added to the alcohol solution; or to the benzine solution, about the same quantity of neatsfoot oil, vaseline, or a mixture of both with train oil.

If celluloid eyelets of boots are to be dyed black at the same time, about 20% of the alcohol or benzine in the aforementioned solutions are substituted by acetone, acetic acid or amyl acetate.

When the leather has absorbed the colour solution and is dry, it is rubbed down with a cloth, being then polished with shoe cream, or coated with the shellac dressing described on page 109, coloured for this purpose with ½—1 lb Nerazine G or BR per 10 gallons.

2. FANCY LEATHER GOODS, PORTMANTEAUX, GAITERS AND FURNITURE LEATHER.

First of all the surface of the leather is cleaned with benzine or carbon tetrachloride in order to remove any adhering dirt.

When dry, the leather is moistened lightly but evenly with a sponge and painted once or several times over with the solution of 3—8 oz of a Basic or Acid Colour per 10 gallons water. The Basic Colours are applied without any further addition, except in the case of hard water when 4—8 oz acetic or formic acid are added, Acid Colours with the addition of 4—6 oz sulphuric acid or 4—8 oz formic acid per 10 gallons varying with the quantity of dyestuff used.

The following dyestuffs are suited for this purpose:

	Basic Colours:	Acid Colours:
Leather Yellow Pea Colour,	Diamond Phosphine GG, PG, R, D.	Indian Yellow G, R Acid Phoshine JO.
Yellow	Thioflavine T Auramine O.	Naphtol Yellow S Milling Yellow O.
Havana	Diamond Phosphine D shaded with any of the above yellow dyestuffs, or with Bismarck Brown EE Leather Brown A New Blue D 120.	Havana Brown S conc. shaded with any of the above yellow dyestuffs, or with Fast Brown D Naphtol Black B Naphtol Blue Black.
Chocolate Brown	Bismarck Brown PS, FF shaded with Leather Brown A Solid Green Crystals O	Fast Brown D shaded with Naphtol Blue R.
Red Brown	Bismarck Brown GG, EE, FF, PS.	Fast Brown D.

	Basic Colours:	Acid Colours:
Oxblood Russian Red	Russian Red G, B Cerise N Oxblood A shaded with Bismarck Brown EE	New Red B for Leather Archil Substitute N Bordeaux BL shaded with Havana Brown S conc.
Red	Safranine, all brands.	Brilliant Croceïne, all brands, Croceïne AZ Scarlet EC Roccelline.
Blue	New Blue G, FL, D 120 New Methylene Blue N, NX, GG, Methylene Blue DBB Neutral Blue.	Cyanole extra, FF Formyl Blue B Naphtol Blue R, G Pure soluble Blue Water Blue R, B Solid Blue R, 6G.
Violet	Methyl Violet 6B—4R Tannin Heliotrope Neutral Violet extra.	Formyl Violet S4B—10B Acid Violet 4RS.
Green	Solid Green Crystals O Malachite Green conc. Brilliant Green Crystals extra	Acid Green extra conc., extra conc. B, 5G. Fast Acid Green BN Naphtol Green B.
Black	Leather Black TBO, TBBO, TGO, BO.	Nerazine G, BR. Nigrosine soluble in water, OHH, OJFB (only for bottoming or for dressings) Naphtylamine Black 4B, D, S, T (only for bottoming) Neutral Black B (only for Grey).

Any damaged portions in the leather which would assume a deeper shade than the undamaged parts if dyed direct are before dyeing coated once or twice with a mucilage prepared by boiling 4—6 lbs starch, carrageen moss or tragacanth with 10 gallons water; when this mucilage has been absorbed, the leather is dyed.

When the leather has fully absorbed the colour solution and is dry, it is coated with a dressing consisting of a shellac solution or collodium varnish. (See the section on leather dressing).

If the leather was previously coated with a dressing which cannot be removed by the above-mentioned cleaning process and washing with luke-warm water, only Acid Colours can be applied, which should be added to a solution of ½ lb shellac, 1½—2½ oz borax or 2½—3¼ oz ammonia per gallon water. An addition of acid must in this instance be omitted.

Severely damaged leather goods can only be dyed black in the manner described for shoes on page 110, or by painting them with a shellac and borax solution, coloured intensively black with Nerazine G, or with spirit varnish coloured with Lake Black C. See also remarks on leather finishes.

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3. GLOVES.

a) Kid gloves, Suède gloves etc., have first to be cleaned, after which they can only be slightly shaded, for which purpose the Acid Colours enumerated on pages 111—112 may be used. A small quantity of the colour solution is added to a soap solution in which the gloves are then kneaded.

Shading may also be done by brushing on a solution containing about ¾ oz of a Cerasine colour per gallon alcohol. The following products are suited for this purpose:

Cerasine Yellow AT, ATG
Cerasine Orange I
Cerasine Brown
Cerasine Red B

which may be combined at will and shaded with Spirit Blue.

Gloves showing worn out places can only be dyed black, for which purpose Lake Black C or Brilliant Black BE or N, dissolved in alcohol, are best suited. When dry, the gloves are to advantage rubbed with a weak soap solution in which some olive oil or castor oil has been emulsified; this tends to intensify the Black and imparts suppleness to the leather.

b) Nappa gloves, if the grain is worn or damaged, are treated in the same way as stated sub a). Unimpaired gloves may easily be dyed to shade with the Basic Colours enumerated on pages 111 and 112. This is done in a lukewarm aqueous solution without the addition of any acid. The dyed gloves are then kneaded in an emulsion consisting of soap solution, neatsfoot oil or olive oil and egg yolk, rinsed slightly, and dried.

Nappa leather represents a kind of kid leather used for sporting gloves and gentlemen's gloves which owing to a subsequent tanning with chrome salts and gambier withstands washing with water.

c) Chamois and Doeskin leather gloves, after having been cleaned in a warm soap solution, are dyed with Immedial Colours. This process, which is suitable for Chamois leather only, is as follows:

Preparation of the dyestuff solution: Equal parts by weight of an Immedial Colour and sodium sulphide crystals are dissolved by pouring boiling water over them. When cold, add of formaline one-tenth and of soap one-fifth of the weight of dyestuff used. The solution is diluted with cold water according to requirement and is then ready for use.

Directions for use: Knead or drum the leather for ½ hour in this solution. The following dyestuffs come chiefly into consideration, yielding full shades with 1—1½ oz per gallon liquor:

Yellow:	Immedial Yellow D.
Yellowish Brown:	Immedial Yellow Brown E Immedial Cutch G.
Reddish Brown:	Immedial Cutch O Immedial Cutch R.
Claret:	Immedial Bordeaux G conc. Immedial Maroon B conc.
Greyish Brown:	Immedial Dark Brown A Immedial Dark Brown D conc. Immedial Bronze A.
Olive:	Immedial Olive 3G Immedial Olive B.
Green:	Immedial Green GG extra.
Blue:	Immedial Sky Blue conc. powder Immedial New Blue G conc.
Black:	Immedial Black NN conc. Immedial Black NB.

After dyeing, rinse thoroughly, wash well in a one percent soap solution, and dry without rinsing again. In order to impart special suppleness to the leather, a little egg-yolk is added to this solution.

If particularly exacting demands are made with regard to fastness to rubbing and washing, the gloves are subjected before the soaping to an after-treatment with a solution of

1½ oz copper sulphate
1½ oz bichrome
8 oz acetic acid (50%)

per 10 gallons water, being kneaded or drummed for 15 minutes in this lukewarm solution.

DYEING OF FURS AND RUGS.

The methods of dyeing described in the following apply equally for new, undyed furs and for white or dyed skins which have already been in use. When dyeing the latter it must be borne in mind that the tips of the hair are mostly in an impaired state from use and therefore assume a considerably darker appearance than the lower portions of the hair. This cannot be avoided, and furs showing this defect in an increased measure should therefore to best advantage be dyed black.

The skins before the dyeing are cleaned by washing with benzine or with soda and soap, and if very greasy, as in the case of sheepskins in particular, are subjected to a treatment in a one percent solution of milk of lime for 1 to 3 hours.

1. DYEING WITH BASIC COLOURS.

Basic Colours come into consideration only for the dyeing of sheepskins, goatskins and angora skins, when the demands for fastness, in particular to rubbing and washing, are not especially exacting. They are applied principally for rugs, and in very light shades also for articles for ladies' wear.

Light shades are dyed in a weak soap solution with any of the following dyestuffs.

For Cream, Chamois, Yellow and Salmon:

Combinations of

Thioflavine T
Rosazeïne B, 13
Irisamine G.

For Greenish Yellow:

Combinations of
Thioflavine T
Victoria Blue B.

For Light Pink:

Rosazeïne B, 13
Irisamine G
Rose Bengale extra N.

For Heliotrope:

Methyl Violet 3B—6B
Crystal Violet 10B.

For Sky Blue and for the Blueing of White:

Victoria Blue B.

Prepare a soap bath of about 40° C. (105° F.) containing 3—4 oz curd or olive-oil soap per 10 gallons, varying with the hardness of the water, add the colour solution, and dye the previously wetted skins for about ½ hour. Then press off or hydroextract.

In order to produce especially delicate tints, the dyed skins are hung up overnight in a sulphur stove (see page 128) and then dried at ordinary temperature.

Full and brilliant shades are dyed in a bath heated to about 40° C. (105° F.) acidulated with 3—5 oz acetic acid per 10 gallons liquor, with the following dyestuffs:

Yellow and Orange:

Thioflavine T
Paraphosphine G, R
Diamond Phosphine GG, R
in combination with
Rosazeïne B, 13
Safranine G No 140
New Magenta O.

Pink:

Rosazeïne B, 13
Rose Bengale extra N.

Red and Claret:

Safranine, all brands
Magenta Ia. Dia.
New Magenta O
Russian Red G, B
Cerise Ia.

Violet:

Methyl Violet 6B—4R
Crystal Violet 5B bluish.

Blue:

Victoria Blue B
New Methylene Blue N
Methylene Blue BB.

Green:

Solid Green Crystals O
Malachite Green conc.
Brilliant Green Crystals extra
shaded with
Thioflavine T
Diamond Phosphine GG
Victoria Blue B.

Brown:

Chrysoïdine AG, Crystals R
Bismarck Brown GG, EE, FFG, PS.

In dyeing according to the above-mentioned directions, the flesh-side of the skin is stained more or less. If this is to be avoided the flesh-side of the dry skin should before dyeing be coated with tallow or a mixture of fat of a somewhat higher melting point, and when the fat has solidified, the skins

are entered into the dyebath, the temperature of which should be at least 5° Cels. (or 10° Fahrenheit) lower than the melting point of the fat.

Another method of protecting the leather from becoming stained is resorted to particularly with manufactured articles of leather, and consists in covering the flesh-side with a thick wheat meal paste and, if necessary, with paper also.

Yet another method is the following: Fasten the skins with the flesh-side to a wooden board or on a frame, and dip the hair side into the dye-liquor to the extent of their length but not with the grain.

Skins the hair of which is very hard and brittle and absorbs the dyestuff with difficulty, are immersed previous to dyeing into a cold weak chloride of lime solution in order to impart to the hair a better affinity for the dyestuff. Better results are ensured when following the chlorinating process described on page 120.

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2. DYEING WITH ACID COLOURS.

In order to allow of a treatment by this method, the skins tanned in the customary manner must first be subjected to a chrome tannage, to impart to them the property to withstand without detriment the high temperature requisite for dyeing.

This process comes into consideration for all kinds of furs to be dyed fancy shades or blacks, particularly for better-class skin rugs required to meet high demands for fastness.

Preparing the Furs.

1. *Chrome Tannage.* The previously cleaned skins are immersed in a bath prepared per 10 gallons water with

5 lbs chrome alum
½ lb formaldehyde.

The temperature of the bath should be about 15—20° C. (60—70° F.). Immerse the skins in the liquor so that it covers the flesh side completely. After about 2 hours, lift the skins, add a solution of 14 oz soda ash whilst stirring, and re-enter the skins, leaving them for 12 to 24 hours, or even longer, in the bath, according to the thickness of the leather; then rinse.

In place of the above chrome alum solution, the so-called chrome-tanning extracts on the market may also be used, but it is in every case advisable to add to the bath the above-stated quantity of formaldehyde which enhances the resistance to heat of the leather.

2. *Chlorinating of the Hair.* In order to impart to the hairs of the skins a better affinity for the dyestuff, the skins are at this stage subjected to a treatment with chloride of lime, according to the following directions:

When still in a wet state, enter the skins

1. for ¼ hour into a bath charged per 100 gallons cold water with 1 gallon hydrochloric acid of 32—36° Tw.; then enter without rinsing,

2. into a cold chloride of lime bath to which the clear solution of 8—13 oz chloride of lime per 10 gallons water is gradually added in four portions. Having worked the skins for 1 hour, whilst taking care that the hair does not felt, re-enter the first acid bath, and work therein for another ¼ hour. Then rinse in lukewarm water, to which 3—4½ oz hyposulphite of soda or sodium bisulphite have been added in order to remove the last traces of the chlorine.

After being pressed off or hydroextracted, the skins are ready for dyeing.

Dyeing the Furs.

Charge the dyebath heated to 50° C. (120° F.) with 10—20% Glauber's salt crystals, 2—5% acetic acid 8° Tw. (calculated on the weight of the goods) and the dyestuff, enter the skins, and raise the temperature gradually to about 75° C. (165° F.). After ½ hour, add 6—8% bisulphate of soda in 2 or 3 portions, and continue working at this temperature for another 20 to 30 minutes. Then rinse thoroughly, and hydroextract.

In order to impart a very soft feel to the hair, the skins after the rinsing are to advantage treated for another ¼ hour in a solution of

12 —16 oz olive-oil soap
1½— 3 oz olive-oil and } per 10 gallons liquor;
1 — 1½ oz ammonia

they are then hydroextracted and dried without having been rinsed again.

The following dyestuffs come into consideration for this method of dyeing:

For Yellow and Orange:

Fast Yellow S
Acid Yellow AT
Fast Acid Yellow 3G, TL
Indian Yellow G, R
Naphtol Yellow S
Milling Yellow O
Tropaeoline G, O, OO
Orange GG, extra, II, IV, R.

For Red, Claret etc.

Lanafuchsine SG, SB, 6B
Azo Orseille BB
Bordeaux BL
Brilliant Orseille C.

For Violet:

Azo Wool Violet 7R, 4B
Acid Violet 4RS, 6BS.

For Blue:

Cyanole FF, extra
Tetra Cyanole V
Indigo Blue N
Azo Wool Blue SE
Naphtol Blue R
Solid Blue R
Formyl Blue B.

For Green:

Naphtol Green B
Fast Acid Green BN, B
Cyanole Green B, 6G
Cyanole Fast Green G.

For Brown:

Combinations of
Fast Yellow S
Acid Yellow AT
Tropaeoline OO
Orange GG, extra
Lanafuchsine SG
Brilliant Lanafuchsine BB, GG, SL
Indigo Blue N
Cyanole Green B, 6G
Cyanole Fast Green G
Fast Acid Green BN.

For light shades, about 0.2—0.5% dyestuff are used, and for full shades up to 3% dyestuff, calculated on the weight of the dry skins.

For Grey:

Silver Grey N
(to be dyed with the addition of 0.5—1% alum).

For Black:

Naphtylamine Black S, ESN, SS2B
Naphtylamine Blue Black B, BD
Naphtol Black B, SG
Azo Merino Black B.

For a deep Black, about 4—6% of the afore mentioned dyestuffs reckoned on the weight of the dry skins should be used. For a very covered Black, the following dyestuffs would come into consideration as shading agents:

Indian Yellow FF
Tropaeoline OO
Acid Yellow AT
Fast Yellow S
Orange II, extra.

The requisite ingredients and directions for dyeing will be found on page 121.

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3. DYEING WITH CHROMATE COLOURS.

This method of dyeing is applied for the same kinds of fur as are dyed with Acid Colours if the demands for fastness are particularly exacting. Most of the fancy shades may be produced with Chromate Colours. Black however is more advantageously dyed with Acid Colours.

The preparation of the furs is the same as when working with Acid Colours. The treatment with chloride of lime may however be omitted, because the hairs possess without this agent a sufficient affinity for Chromate Colours, but it should be resorted to if very full shades are to be produced.

The dyeing is carried out as follows:

Charge the dyebath with the dissolved dyestuff and half its weight of bichrome.* Enter at 70—80° C. (160—175° F.), and maintain this temperature for

* Dyestuff and bichrome should be dissolved separately and mixed in the dyebath only just before entering the goods.

about 1 to 2 hours; then exhaust the bath by an addition of 1—3% acetic acid, working for about another ½ hour; then rinse, and hydroextract.

In order to ensure good levelling on felted wool, 3—4% monosolvol are added to advantage.

The following dyestuffs come into consideration:

For Yellow:

Anthracene Yellow C, BN, GG, R.

For Red:

Anthracene Chrome Red G
Diamine Fast Red F
Wool Red B.

For Blue:

Anthracene Chromate Blue XR
Anthracene Chrome Blue RRW extra
Brilliant Milling Blue B.

For Green:

Anthracene Chromate Green B, KFF extra
Alizarine Brilliant Green G
Brilliant Milling Green B.

For Violet:

Anthracene Chromate Violet XB
or combinations of the above-named Reds and Blues.

For Brown:

Anthracene Chromate Brown EB, ER, 3G.

For Olive:

Combinations of

Anthracene Yellow BN, RN
Anthracene Chromate Brown 3G
Anthracene Chromate Green B, KFF extra
Anthracene Chromate Blue XR
Anthracene Chrome Blue RRW extra.

For Grey:

Anthracene Chromate Grey G, KB.

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4. DYEING WITH FURROL COLOURS.

The Furrols are employed for the dyeing of rugs and furs of every description, in particular for imitations of real furs on cheap material, and for shading real furs.

The method of dyeing consists in two processes, viz., the mordanting and the dyeing proper.

Mordanting the Furs.

A special mordanting of the hair before dyeing is needed for most of the shades coming into consideration, which ensures a more rapid and intense absorption of the colouring matter developing in the dyebath, a variation of the shades being thereby at the same time obtained according to the selection of the mordant. Only very light brown and greyish brown shades can be dyed without previously mordanting the skins.

Solutions of bichrome, copperas and copper sulphate, mixed with some tartar, are used as a mordant. Not more than

5 oz bichrome, copperas or copper sulphate, with or without the addition of 2½ oz tartar

per 10 gallons liquor, are used for the deepest shades, or even for Blacks.

For medium and light shades, correspondingly reduced solutions will prove sufficient.

The skins are cleaned and killed by a 2 to 3 hours' treatment in milk of lime 1:100, whereupon the mordanting is done by immersing them in the solution heated to 20—25° C. (70—75° F.) in which they remain for 12 to 24 hours, varying with the condition of the hair of the individual kinds of fur. After mordanting, the skins are well rinsed and then entered into the dyebath.

Dyeing the Furs.

The following products may be used for dyeing:

Furrol Yellow Brown G for yellow-brown shades
Furrol B for brown shades
Furrol S and PM for black
Furrol Grey G, Furrol Grey R } for grey shades
Phenylene Diamine for shading blacks and greys towards blue.

These dyestuffs yield the desired shade by the action of hydrogen peroxide or sodium perborate added to the bath.

A great number of intermediate shades may be produced by the application of the various mordants alone or in combination with each other. Copperas and copper sulphate may be mixed in any desired proportion, likewise bichrome and copper sulphate; bichrome and copperas cannot however be mixed together.

Further intermediate shades may be produced by mixing the Furrol Colours.

The dyeing proper is carried out in a bath containing per 10 gallons water of 20—25° C. (70—75° F.)

1½— 6 oz Furrol Colours, which are dissolved separately in hot water and then neutralised; hereafter

18 —72 oz hydrogen peroxide (i. e. 12 times the quantity of dyestuff) or ¾—3 oz sodium perborate (i. e. half the quantity of Furrol dyestuff) are added.

When using sodium perborate, same must be neutralised with formic acid immediately before use.

The skins are now immersed in this solution and left therein until the hair has assumed the desired shade. The duration of the dyeing and the mordanting operations will vary from 1 to 6 hours, according to the condition of the hair.

For *Black* it is most advantageous to use a mordant of

5	oz	copper sulphate
per 10	gallons	water,

or for skins with a gambier tannage

3	oz	copper sulphate
1½	oz	copperas
1½	oz	tartar
per 10	gallons	water;

when using Furrol S, a jet black, with a slightly brownish cast is obtained, and with Furrol MP a very deep and bloomy black.

After dyeing, the skins are washed with lukewarm water. In the case of very deep shades, and particularly with Blacks, some unfixed dyestuff occasionally adheres to the hair and thus impairs the fastness to rubbing. Such dyeings are therefore washed repeatedly in a weak, cold soap solution until no more dyestuff comes off. This washing in soapy water is to be recommended also if a very full shade has a tendency to bronze.

BLEACHING PROCESSES.

In the following will be found a compilation of the bleaching processes most in use for the materials referred to in the previous chapters.

BLEACHING OF WOOL AND HALF-WOOL.

For this purpose the following come into consideration:

a) Bleaching by Stoving,
b) Bleaching with Peroxide.

a) Bleaching by Stoving.

This is done either with gaseous sulphurous acid produced by the burning of sulphur in the so-called sulphur stove, or by applying aqueous solutions of the sulphurous acid of commerce or such produced from sodium bisulphite and hydrochloric acid or sulphuric acid. In the first case the previously well cleaned goods are treated for ¼ hour in a cold to lukewarm bath with olive oil soap (3—6 oz per 10 gallons), hydroextracted evenly, and hung up overnight in the stoving chamber in which 5—6 lbs sulphur per 100 lbs of goods are burnt, being ignited by means of a piece of red hot iron. It is essential that a sufficient amount of air is admitted into this sulphur stove from below in order to allow of the sulphur burning completely and to prevent it from sublimating on the goods.

Various blue and violet dyestuffs may be added to the soap bath for blueing the white, the Methyl Violet or Crystal Violet brands being well suited for the purpose, as also Alizarine Cyanole B and Alizarine Cyanole Violet R. The tinting may moreover be done with these dyestuffs also subsequently.

After the stoving, the goods are rinsed thoroughly in very clean water, being then blued if necessary, and finally dried, to best advantage in the open air.

If it be desired to evade working in the sulphur stove, the work may be carried out in an aqueous solution either with commercial sulphurous acid, correspondingly reduced, or with sodium bisulphite and acid. In the latter case, the goods, after being well cleaned, are taken into a cold bath containing a sufficient amount of sulphurous acid or 3—5 gallons bisulphite of 64° Tw. per 100 gallons and about ¼—½ gallon sulphuric acid 168° Tw., in which they are left lying for several hours or overnight; hereafter they are rinsed, first in a cold bath slightly acidulated with sulphuric acid, the rinsing being then completed in clear water. The blueing may be carried out with any of the afore-named dyestuffs either straightaway in the bisulphite bath or in the last rinsing water.

By the use of permanganate and sulphurous acid or bisulphite, a more powerful bleaching action is exerted than by the method described above. After cleaning the material well, treat for ½ hour in a cold bath charged with 20—35 grains potassium permanganate per 10 gallons. The bath, which is red at first, stains the goods light brown in a short time; they are then lifted, rinsed cold, whizzed, and bleached with sulphurous acid or bisulphite and sulphuric acid, acidified, and treated as stated above.

It is best to use wooden or earthenware vessels when working with sulphurous acid and bisulphite.

Brass hooks and eyes, pins, or other pieces of metal should carefully be removed before stoving and working with sulphurous acid and bisulphite, because spots are otherwise very apt to result.

b) Bleaching with Peroxides.

A finer and more permanent white is obtained by this method than by bleaching with sulphur or sulphurous acid.

The bleaching agents used are either peroxide of hydrogen or peroxide of sodium. The bleaching is always carried out in wooden or earthenware vessels provided with a leaden steam-coil separated from the goods by a false bottom. The only metals which are allowed to come into contact with the bleaching baths are lead and tin.

Of *peroxide of hydrogen*, the commercial article of 10—12 percent by volume is used, diluted with 5 to 8 times its weight of cold water; enough ammonia is then gradually added to cause the baths to react slightly alkaline. This test is carried out by means of red litmus paper, which turns bluish in an alkaline bath. A correspondingly smaller quantity is needed of the product containing 70 percent by volume which has been marketed recently.

Heat now gradually to 40—50° C. (105—120° F.), enter the goods, previously well washed, give several turns, immerse the goods so that they are completely covered by the liquor, and leave them in the bleaching bath until the desired effect is obtained. As a rule, the material is placed in the vat in the evening, being left there overnight and care being taken that it is completely immersed in the liquor; this is best effected by covering the goods with a wooden lattice frame. Hereafter rinse, and if necessary blue in a rinsing bath slightly charged with one of the dyestuffs mentioned on page 129; in order to increase the bleaching effect, it is advisable to treat for another hour in a cold bath charged with 3 gallons bisulphite

64° Tw. and 1 quart conc. sulphuric acid per 100 gallons liquor, to rinse, and then to blue.

The bleaching baths may be used over again for subsequent lots; if not used again immediately, they are acidified after use so that they just begin to react acid (blue litmus paper being slightly reddened), and when taken into use again are freshened up with one-third to one-half of the starting quantities above indicated, a further quantity of ammonia being at the same time added.

When working with *peroxide of sodium*, charge the bath per 10 gallons in the first place with

1 lb 6 oz—1 lb 13 oz conc. sulphuric acid,
scatter 1 lb—1 lb 6 oz sodium peroxide

gradually into the bath, stir thoroughly, and add ammonia until a weak alkaline reaction sets in.

The method of working is the same as with peroxide of hydrogen.

Paper, pasteboard, wood etc. should not be used in weighing out sodium peroxide, because, if slightly damp, they may lead to explosions.

BLEACHING OF SILK, HALF-SILK AND WOOL-SILK.

Generally speaking, precisely the same bleaching processes may be applied for silk, half-silk and wool-silk as recommended for wool and half-wool; for the blueing the same dyestuffs are likewise used as there indicated.

The only deviation from the directions given is in the bleaching of Tussah silk (raw silk), for which material, on account of its brown ground shade, the sulphur bleach is of little use, even when a preliminary treatment with permanganate is given. Altogether, it is practically impossible, or at any rate very difficult, to obtain a pure white on Tussah silk; at the same time, very useful results

may be obtained with hydrogen peroxide or sodium peroxide by making the bleach baths correspondingly stronger, approximately as follows:

Dilute 10 gallons hydrogen peroxide (12 Vol. percent) with 3 to 4 times the weight of water, and add waterglass until a feebly alkaline reaction sets in. After cleaning the Tussah silk well with boiling soap and a little soda, enter it at about 40° C. (105° F.) into this bath, to advantage charged with 4—8 oz soap per 10 gallons, gradually raise the temperature to boiling heat, and leave for 6 to 8 hours or overnight in this bath. When the bleaching is complete, rinse thoroughly, treat for several hours in a bisulphite bath prepared as described on page 129, and rinse well once more.

The bleaching operation with sodium peroxide is carried out as follows:

Add 4 lbs sulphuric acid to about 10 gallons water, gradually scatter 3 lbs sodium peroxide into this solution, and add waterglass until a feebly alkaline reaction sets in. After adding some soap, work in exactly the same manner as with hydrogen peroxide, likewise treating subsequently with bisulphite.

BLEACHING OF COTTON, LINEN, CHINA-GRASS AND ARTIFICIAL SILK.

For the bleaching of cotton, the customary chlorine bleach comes into consideration. The cotton is in the first instance boiled with soda (3—4½ oz per 10 gallons); heavily sized goods are soaked in cold water previous to the boiling, and then treated with diastafor in order to remove the starch finish (see page 71). The material is then rinsed, and placed for several hours, or overnight, in a chlorine bath of ¾—1½° Tw. This chlorine bath is prepared with bleaching powder very well rubbed down and mixed with a copious quantity of water in a wooden or earthenware vessel; the mixture is allowed to settle, and the clear liquid is passed through a cloth into

the bleaching bath prepared in a wooden vessel. When the goods are sufficiently bleached, they are rinsed thoroughly in cold water, soured lightly with sulphuric or hydrochloric acid, taken through a warm soap bath, or better still through a cold bath of hyposulphite of soda (1½—3 oz antichlor per 10 gallons), rinsed once more, and blued.

For blueing, the various brands of New Methylene Blue, Methyl Violet, Water Blue, Azural Blue may be used, or Alizarine Cyanole B and Alizarine Cyanole Violet R if superior fastness to light is required; it is an advantage to keep a filtered stock solution of these products, of ¾—1½ oz per gallon, of which a few drops at a time are added as required.

Hydrogen peroxide and sodium peroxide may be used also for bleaching cotton, but work out more expensive than the chlorine bleach.

Of late, perborate is being employed quite extensively, in particular for bleaching white goods. A special bleach bath is not usually prepared, the bleaching being carried out straightaway in the washing baths by adding very small quantities of perborate thereto. The goods are to best advantage washed in the first place with soap and soda only, a second bath being then given with 300—350 grains perborate, then ten times as much curd soap and 4 to 5 times as much soda ash per 10 gallons water. Enter the goods into the lukewarm perborate bath, raise the temperature gradually to 80—90° C. (175—195° F.), and work for another ½ hour. Hereafter run off the bath, and carefully rinse, once or twice warm and then cold. Too large an addition of perborate acts detrimentally on the texture of the fabric and also on washable coloured goods.

Linen and *half-linen* may be treated in exactly the same manner as cotton. For very dark-coloured raw linen it is necessary however to prolong the boiling or to repeat it after the chlorine

bleach. As a rule, a single bleaching with chlorine will not be sufficient, and, like the souring, will have to be repeated. It is a great advantage, which is favourable too to the preservation of the material, to bleach several times on the grass before or after the chlorine bleach.

China-grass and *Artificial Silk* are rarely bleached, but if bleaching should be required, it is done in exactly the same way as with cotton. In the case of Artificial Silk, however, strong chlorine or acid baths should be avoided; a good rinsing and a treatment with antichlor are of special importance.

BLEACHING OF JUTE AND COCOA-NUT FIBRE.

These materials, which in their natural state have a darkish brown colour, are not as a rule fully bleached, but in the majority of cases are merely given a light bleach when they are to be dyed bright shades. For this purpose soak the material for several hours or overnight in a warm soda bath (3—4½ oz per 10 gallons), then boil for an hour with soda, rinse, and place for several hours in a bleaching bath of ¾—1½° Tw. of hypochlorite of soda (Eau de Javelle). Hereafter rinse thoroughly, acidulate lukewarm with about 8 oz hydrochloric acid and 1 lb bisulphite 64° Tw. per 10 gallons, and rinse once more well.

In addition to this chlorine bleach, a bleach with permanganate and bisulphite as described for wool (page 129) is frequently resorted to; in the case of jute or cocoa-nut fibre the bisulphite bath may be slightly warmed. A stronger bleach effect, or even a complete bleach, may be obtained by working first with Eau de Javelle and subsequently with permanganate and bisulphite.

A fairly good half-bleach may be produced by immersing the material for several hours in a solution of 2—3 lbs bisulphite and 8—12 oz hydrochloric acid per 10 gallons at a temperature of 50° C. (120° F.). The material should subsequently be well rinsed.

BLEACHING OF FURS AND SKINS.

Skins are usually bleached in a solution of hydrogen peroxide by brushing the hair once or several times over with the solution and leaving them to lie damp until the desired effect has been obtained. White skins may also be bleached by suspending them in a sulphur stove, but care has to be taken that the leather portion is not wet.

Previous to the bleaching, the skins should be thoroughly cleansed with soap and a little ammonia, and then carefully washed in water. After the bleaching, they may be blued in the manner indicated for wool.

BLEACHING OF FEATHERS.

For feathers, the same methods as given for wool come into consideration, the bleaching thus being effected with sulphur or sulphurous acid, or again with hydrogen or sodium peroxide; great care has however to be taken when working with sodium peroxide that the baths are not too strongly alkaline, which would destroy the delicate flue of the feathers.

Previous to the bleaching the feathers should be cleaned thoroughly with soap and a little ammonia, and then well rinsed. The same dyestuffs as for wool may be used for the blueing.

BLEACHING OF STRAW.

If a light bleach only is required, the stoving process will come into consideration, but if a good full-bleach be desired, the method with hydrogen or sodium peroxide, if necessary followed by stoving, should be applied.

Stoving. Wet out the material well in a lukewarm soap bath, washing it previously if very dirty, then whizz, and suspend in a damp state in the sulphur stove (see page 128), leaving it there overnight or for a more extended period exposed to the fumes of burning sulphur. When the bleaching is complete, rinse, and dry by exposure to the air.

Bleaching with Peroxide of Hydrogen. Wet out the material well at 60—70° C. (140—160° F.) in clear water or in a bisulphite solution of 1½—3° Tw., then rinse, and treat in a hydrogen peroxide bath prepared as a rule of 1 part commercial hydrogen peroxide 10—12 Vol. percent and 2—3 parts clear water. For neutralising the bath, either waterglass or better still sodium peroxide should be used. In addition, 1½—3 oz neutral oxalate of potash should be added per 10 gallons to this bleach bath.

The treatment in this bath is carried out at a temperature of 40—50° C. (105—120° F.), and usually extends over one to three days according to the colour of the plaiting. It is an advantage to lift the straw from this bath once or twice during this time, and without rinsing to dry it lightly in the air. Hereafter rinse, and immerse for several hours in a bath of 40—50° C. (105—120° F.) containing 4—8 oz oxalic acid per 10 gallons. Then lift, rinse once more, and immerse for a few hours in a weak soda bath (1½—3 oz per 10 gallons), rinse, whizz, and stove overnight in the sulphur stove. Then rinse again, and blue with Acid Violet 6BS; this

blueing may also be effected in the hydrogen peroxide bath, in which case a trace of New Methylene Blue N or R is added.

If a single bleach does not produce a satisfactory white, the whole process may be repeated.

BLEACHING OF FLOWERS, LEAVES AND GRASSES.

It is by no means an easy matter to bleach flowers, leaves and grasses if the condition of the material is to be well preserved and must not be affected or tendered by the bleaching.

It has also to be considered that the dyestuff in the different species of plants varies a great deal so that no general bleaching method can be recommended for them all.

Although the application of the customary bleaching agents such as chlorine, hydrogen peroxide, permanganate, sulphurous acid produces a sufficient bleach effect in certain cases, the material is always more or less affected, and for this reason it is always best to remove the greater part of the colour, especially in the case of very intensely coloured material by a preliminary treatment, carried out either with alcohol and turpentine or with alcohol and carbon tetrachloride. When applying the first of these methods, the material in a fairly dry state is entered into a lukewarm bath consisting of 2 parts alcohol and 1 part turpentine oil, and left therein for about 24 hours. It is then lifted, and after draining well left exposed for some time to sunlight, the formation of ozone by the use of turpentine oil exercising a bleaching action. A similar effect is produced by using alcohol and carbon tetrachloride. A bath is prepared of about equal parts of alcohol and carbon tetrachloride, in which the material is

left for 24 hours, being then dried in the strongest possible sunlight. Both processes may be repeated as required.

If the bleach effect is insufficient, the material is immersed first of all for a few hours in weak caustic soda lye of 77° Tw. (about ½ lb per gallon water), and rinsed, the bleaching then being completed either with permanganate and bisulphite similarly as described for wool on page 129, or in a bath of chloride of lime ¾—1½° Tw., being subsequently soured or aftertreated with bisulphite and hydrochloric acid. Good results may likewise be obtained with baths of hydrogen peroxide, if sufficiently strong, these being prepared in the same way as for the bleaching of straw.

In order to render the material pliable, it may after the bleaching be treated with glycerine or calcium chloride, being then dried without rinsing.

BLEACHING OF HORSE-HAIR.

A pure white is only obtainable when the material itself is white.

Before bleaching, the horse-hair should be well scoured in a handwarm bath containing 1½—3 oz soda ash or ammonia and 8 oz soft soap per 10 gallons water, being then carefully rinsed.

The bleaching is carried out in the same way as for wool with hydrogen peroxide as described on pages 130 and 131.

WATER-PROOFING.

The water-proofing of fabrics of all kinds is as a rule to best advantage carried out for purposes connected with garment dyeing by depositing salts of fatty acids or fats on the fabric; if salts of fatty acids are to be deposited, this can be done by the usual wet method, fats on the other hand being applied by the dry method with the aid of benzine, carbon tetrachloride etc.

(a) Water-Proofing by the Wet Method.

Enter the material, previously well cleaned or dyed, in the dry state into an acetate of alumina bath of 8° Tw. either cold or up to 30° C. (85° F.), treat therein for ½ to 1 hour, whizz or press off, and dry. Hereafter enter the material into a warm soap bath of 30—40° C. (85—105° F.), containing 3—8 oz neutral soap per 10 gallons, treat therein for about ¼ hour, whizz, and dry without rinsing. The effect of the impregnation is enhanced by adding one-half to one-third the weight of Japan wax as of soap, which is boiled up previously with the latter.

(b) Water-Proofing by the Dry Method.

By the dry method the water-proofing may be effected to very good advantage by dissolving fats like paraffine, ceresine, carnauba or Japan wax, or salts of fatty acids as for instance an alumina salt, in benzine or carbon tetrachloride, and treating the goods in this solution, then whizzing and drying them. As a rule, 1 part of fat is dissolved warm in 3—4 parts of benzine (benzene, carbon tetrachloride).

RENDERING FABRICS NON-INFLAMMABLE.

By practical methods which are easy to carry out it is only possible to render textile fabrics fireproof or non-inflammable to a certain degree. The first and only point here to be considered will be the rendering of fabrics as resistant as possible to ignition when coming into contact with flames.

The simplest manner to obtain this result is to saturate the fabric with solutions of metallic salts, of which sulphate of ammonia, borax, phosphate of soda, tungstate of soda, waterglass etc. in particular yield very good results.

Solutions of 1—2 lbs of these salts per gallon are used, to which 1—2 lbs glycerine are added to prevent them from crystallising. The fabrics are well impregnated with the cold solutions, whizzed, or squeezed off, and dried without rinsing.

Still better effects, which are more resistant particularly to washing, are obtained by treating the fabrics according to British Patent No 8509/1902, first of all with a 41° Tw. cold solution of stannate of soda, drying, and hereafter working in a bath containing 2 lbs sulphate of ammonia per gallon, and finally drying without rinsing.

Fabrics may be rendered fireproof and waterproof simultaneously according to the following process:

Treat the goods in an acetate of alumina bath of 8° Tw., whizz or squeeze off, then treat in a cold bath with 8 oz soap and 8 oz waterglass per 10 gallons, and whizz, entering then into a third bath containing 8 oz alum, 3 lbs borax and 20 lbs ammonium sulphate per 10 gallons. Hereafter dry, without rinsing.

PART II.

Dyeing of Feathers.

" " Straw, Straw Plaiting and Straw Hats.

" " Wood Chip and Tagal Plaiting.

" " Brush and Upholstery Material.

" " Human Hair.

" " Natural Flowers, Leaves, Grasses, etc.

" " Material for Artificial Flowers.

" " Wood for Inlay Work, Furniture, Fancy Goods, Matches etc.

" " Celluloid Articles and Celluloid Films.

" " Material for Button Manufacture (Vegetable Ivory, Horn, Ivory, Mother of Pearl, Galalith, Bakelite).

DYEING OF FEATHERS.

For feather dyeing, Acid Colours are mostly used, and Basic Colours in exceptional cases only.

The feathers must before dyeing be cleansed well from dirt and from the natural grease they contain, for which purpose lukewarm, weak baths of soda or ammonia, if necessary with the addition of some soap, are used, in which previously dyed colours the feathers contain are as a rule stripped, and after the cleaning they are well rinsed in lukewarm water. Very hot or too strongly alkaline baths are apt to impair the material, and should therefore be avoided.

If the feathers are not sufficiently stripped in the cleansing bath, a further stripping may be effected with Hyraldite in accordance with the indications of page 3.

a) DYEING WITH ACID COLOURS.

Pink, Red, Claret:

For Pink, the various Eosine dyestuffs are used, such as

Eosine GGF, BN
Erythrosine D
Phloxine S
Rose Bengale extra N
Rosazeïne B, 13.

For bright Scarlets and Reds:

†Brilliant Croceïne, all brands
†Brilliant Lanafuchsine BB, GG
Croceïne AZ
Roccelline
Naphtol Red C, EB
Bordeaux BL
Acid Magenta.

For Claret, the afore-mentioned red dyestuffs are used for covered shades, being saddened with

Formyl Violet S4B
Cyanole extra
Brilliant Milling Green B
Solid Blue R, 3R.

If necessary, the feathers may be lightly bottomed with

Formyl Violet S4B or
Solid Blue R

and topped with red dyestuffs in a fresh bath.

Light Blue, Blue, Navy Blue:

For Light Blue:

†Alizarine Cyanole EF, B
Cyanole extra, FF
Tetra Cyanole V, A
Alkaline Blue 4B, 6B.

Medium blue shades are obtained with

†Alizarine Cyanole SB, SR, SG, KR
Formyl Blue B
Brilliant Milling Blue B, FF, FG
Pure Soluble Blue
Water Blue B, R
Alkaline Blue B, R, 3R.

For Navy Blue:

Solid Blue R, 3R, 07410

or a combination of

†Naphtol Blue Black
Pure soluble Blue
†Alphanol Blue GN, BR extra
Formyl Violet S4B
Brilliant Milling Green B.

For saddening:

Orange extra
Acid Magenta.

Green, Dark Green, Olive:

Bright green shades are obtained with

Acid Green extra conc., B, 5G
†Cyanole Fast Green G, GG
Cyanole Green 6G, S, B
Brilliant Milling Green B
Anthracene Direct Green B
†Alizarine Brilliant Green G;

for shading towards yellow:

Indian Yellow FF, R, G
Acid Yellow AT;

for shading towards olive:

Orange extra
Acid Brown D.

Dark green and olive shades are obtained with the same dyestuffs by saddening with

Naphtol Dark Green G
Anthracene Direct Green B
Naphtol Blue Black
Solid Blue R.

Violet and Prune:

The following may be used:

Alizarine Cyanole Violet R
Formyl Violet, all brands
Acid Violet 6BS, 4RS;

for saddening and shading:

Lanafuchsine SG, SB
Roccelline
Cyanole Green B
Indian Yellow R.

Brown and Dark Brown:

For light brown shades:

Acid Brown D, 9929A.

Dark browns are obtained with the same dyestuffs by saddening and shading with

Cyanole Green B
Solid Blue R, 3R
Naphtol Blue Black;

for reddening:

Lanafuchsine SG, SB
Roccelline;

for shading towards yellow:

Indian Yellow G, R, FF
Orange extra, GG.

Feathers are very often bottomed with Solid Blue R or Alkaline Blue B, being then topped with the afore-named brown, red or yellow dyestuffs.

Very full dark browns are obtained with

Anthracene Chromate Brown EB, ER,

if necessary topped subsequently in a fresh acid bath in any way desired.

Grey and Mode Shades:

For greys, the following are used in the first place:

Nigrosine soluble in water
Aniline Grey B, R
Silver Grey N
Induline B.

For greys and mode shades, combinations of the following are also frequently employed:

*Cyanole Green B
*Lanafuchsine SB, SG
*Orange extra, GG
*Acid Yellow AT
*Indian Yellow G, R, FF
Acid Brown D.

For greys and mode shades of very good fastness to light, combinations of

†Alizarine Cyanole EF, BB, SB
†Fast Acid Yellow TL, 3G
†Orange GG
†Brilliant Lanafuchsine GG, BB

are used.

Black:

For *fancy feathers*, the following are particularly well suited:

Feather Black GS
Naphtol Blue Black
Naphtylamine Black 4B, 6B;

for shading:

Formyl Violet S4B
Formyl Blue B
Brilliant Milling Green B
Orange extra
Indian Yellow R.

On *ostrich feathers* it is considerably more difficult to obtain a fine, full black, yet good blacks may be produced with

Feather Black 202J
†Naphtyl Blue Black N
Neutral Wool Black B, G
Alphanol Black BG, KWAN extra conc.

For shading, the dyestuffs used for fancy feathers are employed.

Superior results are obtained on ostrich feathers by dyeing first with

†Anthracene Acid Black DSN, shaded with
†Anthracene Yellow C and
†Anthracene Chromate Green B,

after-chroming with the addition of copper sulphate, and topping with logwood in a fresh bath.

Dyeing Directions for Acid Colours.

a) Fancy Shades.

Dye for 1 to 2 hours at boiling temperature in not too short a liquor with the addition of 10—15% bisulphate of soda, which in the case of goods difficult to dye level is best added to the bath in two portions; for material of this description, particularly for the production of grey and mode shades, the easily levelling dyestuffs marked with an asterisk (*) come in the first place into consideration. After dyeing, rinse well, first in cold water and then in a bath acidulated lightly with sulphuric acid.

In the case of Alkaline Blue, dye at about 90° C. (195° F.) with the addition of a little soda or borax, rinse, and brighten in an acid bath.

Alphanol Blue and the Eosine brands are best dyed in a weak acetic acid bath only.

Anthracene Chromate Brown EB and ER: Add the dyestuff, well dissolved, to the dyebath at 60—70° C. (140—160° F.), then the bichrome dissolved separately (about one-half the weight of the dyestuff) heat gradually to the boil, and work for 1 to 1½ hours at boiling heat. A slight addition of acetic acid (1—3%) causes a quicker absorption of the dyestuff.

The products of particularly good fastness to light are marked with a cross (†).

b) Black.

Fancy Feathers: Dye in as short a bath as possible with 6—10 oz dyestuff and 1½—2 oz sulphuric acid or 3—4½ oz bisulphate of soda per 10 gallons liquor, working at boiling heat for 1 to 2 hours. The baths are not exhausted, and are reserved for further use.

Ostrich Feathers: Charge the bath, which should be as short as possible, with 10—16 oz dyestuff and 1 lb acetic acid or 3—4½ oz formic acid per 10 gallons liquor, and dye for 1 to 2 hours at boiling temperature.

Anthracene Acid Black DSN: Dye with the addition of 3—5% acetic acid 8° Tw. or 1—2% formic acid 85% at the boil; after the dyeing, mordant for 1 to 2 hours in a fresh, boiling hot bath with 3—4% bichrome, 2—3% copper sulphate and 1% formic acid, then rinse, and top boiling hot with logwood and fustic extract. Hereafter brighten in a hot soap bath with the addition of a little oil or in a weak bath with Eau de Javelle.

For shading the Anthracene Acid Black DSN bottom, Anthracene Yellow C or Anthracene Chromate Green B may be used in the case of deep blacks.

B. DYEING WITH BASIC COLOURS.

The following Basic Colours are particularly well suited:

Magenta, all brands
Cerisa Ia, N
Methyl Violet, all brands
Bismarck Brown, all brands
Indazine M
Brilliant Green crystals extra.

Dye light shades in a soap bath of 30—40° C. (85—105° F.), deep shades with the addition of 3—5% acetic acid at 70—80° C. (160—175° F.).

DYEING OF STRAW, STRAW PLAIT AND STRAW HATS.

Straw, straw plait and straw hats should before dyeing be wetted for several hours or overnight in boiling water or in a bisulphite solution of 1½—3° Tw.; varnished hats should first be cleaned in a hot soap and soda bath. For light colours, the material has first to be bleached, which is best done either by stoving, or, if the material to be treated is very dark, with sodium or hydrogen peroxide in accordance with the indications on pages 136 and 137.

The following dyestuffs may be used for dyeing *straw* and *straw plait:*

a) Basic Colours, particularly for bright, full shades, mode shades and blacks on material easy to penetrate;

b) Acid Colours for every kind of shade, particularly for material which is difficult to penetrate; or

c) Diamine Colours, more especially for blacks.

a) BASIC COLOURS.

The following are used for

Yellow and Orange:

Thioflavine T, TCN
Paraphosphine GG, G, R
Tannin Orange R, GG
Chrysoïdine, all brands.

Pink, Red and Claret:

Irisamine G
Rosazeïne 6G
Scarlet for Cotton
Safranine } all brands
Magenta }
Tannin Heliotrope
Cerise Ia, N
Russian Red B.

Blue and Navy Blue:

New Methylene Blue GG, N, R, 3R
Indazine M
New Blue B, R, D
Navy Blue 010650J.

Green and Olive:

Brilliant Green Crystals extra
Solid Green Crystals O
Mignonette 3935J
Green 3570J.

Violet:

Methyl Violet, all brands
Crystal Violet 5B bluish, 10B.

Brown:

Bismarck Brown, all brands
Leather Brown A, B.

Black:

Tannin Leather Black M
Jute Black, all brands.

Iridescent ("Changeant") effects are obtained with combinations of

Methyl Violet, all brands and
Thioflavine T, TCN.

Dyeing Directions for Basic Colours.

Enter the wetted material while still hot into the lukewarm bath, and dye gently boiling with the addition of 2—5% acetic acid 8° Tw. for 2 to 3 hours, or until the goods are sufficiently penetrated, which may be facilitated by an increased addition of acetic acid.

In order to obtain better penetration in the case of dark shades, it is advisable to allow the material to cool down in the dyebath overnight.

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b) ACID COLOURS.

The following dyestuffs come into consideration:

Yellow, Orange and Brown:

Indian Yellow FF, R, G
China Yellow B
Acid Yellow AT
Orange II, extra, EN, GR Special
Tropaeoline RNP, OO
Acid Brown D
Alphanol Brown B
Anthracene Acid Brown G, B.

Red and Claret:

Rosazeïne B
Eosine GGF
Erythrosine B
Brilliant Croceïne, all brands
Roccelline
Wool Red B
Azo Wool Violet 7R
Lanafuchsine 6B.

Blue and Grey:

Tetra Cyanole V
Alizarine Cyanole EF, B, K3G, KR
Formyl Blue B

Brilliant Milling Blue B, FF, FG
Pure Soluble Blue
Water Blue B, R, RS
Solid Blue R, 3R
Lanacyl Blue BB, R, BN, RN
Alphanol Blue 5RN, GN
Anthracene Blue Black C
Naphtol Blue Black
Anthracene Acid Black DSF
Alphanol Black R
Aniline Grey B, R
Nigrosine.

Green:

Brilliant Milling Green B
Anthracene Direct Green B
Alizarine Brilliant Green G.

Violet:

Formyl Violet S4B
Alizarine Cyanole Violet R
Anthracene Chrome Blue F, G.

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c) **DIAMINE COLOURS (ESPECIALLY FOR BLACK):**

Oxy Diamine Black JE, JEI, JB, JW, JWF, [UI, FFC
Diamine Jet Black OO.

Dyeing Directions for Acid and Diamine Colours.

Dye in a concentrated bath, charged with comparatively large quantities of dyestuff, at boiling temperature, for 3 to 4 hours, and in the case of hard plaiting for 5 to 6 hours, without any addition. It is advisable to use as soft water as possible.

When the dyeing is completed, rinse cold, hydroextract severely, and dry at a low temperature.

TWO-COLOURED EFFECTS ON SPLIT STRAW.

These are produced to best advantage with Immedial Colours by treating the dry plait for 10 to 20 minutes in a bath of 20—25° C. (68—77° F.) containing per 10 gallons of liquor 1—3 lbs Immedial Colour dissolved with a corresponding quantity of sodium sulphide.

The following quantities may for instance be used per 10 gallons liquor:

For Black and White
3 lbs Immedial Black NF
dissolved with 2½ lbs sodium sulphide crystals
or 1½ lbs Immedial Black NNG conc.
dissolved with 1½ lbs sodium sulphide crystals.

For Brown and White
1 lb Immedial Cutch O
dissolved with 1 lb sodium sulphide crystals.

For Dark Brown and White
1 lb Immedial Dark Brown A
dissolved with 1 lb sodium sulphide crystals.

For Green and White
1 lb Immedial Deep Green B
dissolved with 1 lb sodium sulphide crystals.

For Blue and White
1 lb Immedial Indone R conc.
dissolved with 2 lbs sodium sulphide crystals.

In addition thereto, the dyebath is charged with 8 oz soda ash and 2 lbs desiccated Glauber's salt per 10 gallons.

The dyeing should be carried out rather quickly. When completed, rinse thoroughly in cold and lukewarm water, then immerse for ½ to 1 hour in a bath of 70—80° C. (160—175° F.) containing 3—4½ oz sulphuric acid and 3—4½ oz bisulphite 64° Tw. Hereafter rinse well, for Black adding 8 oz acetate of soda per 10 gallons to the last rinsing bath.

Plait dyed in this manner may then be overdyed with Acid Colours or bleached by stoving.

DYEING OF STRAW HATS.

Straw hats may be dyed exactly as afore described; sewing threads, if not sufficiently well dyed, may be subsequently stained with Diamine Colours in a cold bath (see page 20).

DYEING OF WOOD CHIP AND TAGAL PLAIT.

Before dyeing, the material is wetted out well in boiling water; any bleaching which may be necessary is done according to the directions on pages 136 and 137.

The following dyestuffs are used for dyeing wood chip and tagal plait:

a) Basic Colours, particularly for very bright shades;

b) Acid Colours, for light and very clear shades and mode colours;

c) Diamine Colours, for deep shades and mode colours and black on fabrics difficult to penetrate.

Of the Basic Colours, any of those mentioned on pages 150 and 151 may be applied according to the dyeing directions there indicated.

Of Acid Colours, those mentioned on pages 152 and 153 are suited. The dyeing is carried out in a rather dilute, weak liquor at the boil with the addition of 2—5% acetic acid for about an hour, whereupon the goods are rinsed thoroughly, and dried at a moderate temperature.

The Diamine Colours are practically all applicable, the following being particularly well suited for

Yellow and Orange:

Thioflavine S
Diamine Fast Yellow A, B, FF, M
Diamine Yellow CP
Diamine Orange B, F
Diamine Fast Orange EG, ER
Oxy Diamine Orange G, R.

Red and Claret:

Diamine Red 4B, 6B, 10B
Diamine Purpurine B, 3B, 6B, V
Diamine Fast Red F, 3906J
Diamine Rose GD, BD
Diamine Fast Scarlet, all brands
Diamine Violet Red
Diamine Bordeaux B, S, BR
Diamine Brilliant Bordeaux R
Diamine Brilliant Rubine S.

Blue:

Diamine Sky Blue, FF
Diamine Blue RW, 3B, 2B, BX, C4B
Oxy Diamine Blue B, G, 3G, 5G, PG, PR
Diamine Azo Blue No 51, 54
Diamine Steel Blue L
Diamine Fast Blue G, FFB, FFG
Diamine Bengal Blue R
Diamineral Blue R
Diamineral Blue R, CV, 3RC
Diamine Dark Blue B.

Green:

Diamine Green B, G, CL
Diamine Dark Green N.

Violet:

Diamine Brilliant Violet B, RR
Diamine Fast Violet BBN
Diamine Violet N, BB
Oxy Diamine Violet R, B, G.

Brown:

Diamine Brown 3G, M, R
Oxy Diamine Brown G, RN
Diamine Catechine 3G, G, B
Diamine Fast Brown G, R, GB
Cotton Dark Brown BM, BB.

Mode shades:

Combinations of

Diamine Fast Brown GB
Diamine Fast Orange ER
Diamine Fast Yellow B, M
Diamine Fast Grey BN
Diamine Fast Blue FFB.

Grey and Black:

Diamine Fast Grey BN, RN
Oxy Diamine Black JE, JEI, JB, JW, JWF, FFC
Diamine Fast Black X, GV extra conc.

Dyeing Directions for Diamine Colours.

Dye the well wetted material for 1 to 2 hours at the boil with the addition of 5—20% desiccated Glauber's salt; in the case of material difficult to penetrate, it is advisable to add ½—1% soda ash or borax.

Hats made of wood chip or Tagal plait are dyed according to the same directions; if it is necessary to cover the sewing threads, this is done to best advantage with Diamine Colours in a cold bath. (See page 20.)

DYEING OF BRUSH AND UPHOLSTERY MATERIAL.

a) DYEING OF HORSE-HAIR AND BRISTLES.

The material is to advantage cleaned well first in a lukewarm bath of about 40° C. (105° F.) with 1½—3 oz soda or ammonia and 8 oz soft soap per 10 gallons liquor; afterwards the goods are well rinsed.

Acid Colours come principally into consideration for dyeing, the following being specially well suited:

Indian Yellow R
Orange extra
Brilliant Croceïne, all brands
Azo Rubine A
Roccelline
Cyanole extra
Formyl Blue B
Formyl Violet S4B
Acid Green extra conc.

and for Blacks:

Naphtylamine Black TJ, SS2B, SS3B, HWN, SOO.

Directions for Dyeing:

Charge the bath with the requisite quantities of dyestuff and 2—3% sulphuric acid; enter the goods at about 50° C. (120° F.), raise to the boil, and boil for about one hour.

In the case of Black it is well to commence with one-half of the requisite dyestuff and ½—1% sulphuric acid, and to work well, then to cover up the material with a perforated cover weighted with stones and to boil for ½ hour; hereafter add the remainder of the dyestuff and 1% sulphuric acid, boil for another ½ hour and finally rinse; in order to produce a high lustre on the goods they are subsequently soaped lukewarm.

b) DYEING OF FIBRE, SISAL, PIASSAVA, MANILA HEMP, KAPOK.

Fibre and sisal are dyed either with *Diamine Colours* or for specially bright shades with *Basic Colours;* as a rule the dyestuffs mentioned on pages 71—77 and 87 may be used in accordance with the directions there given. On account of the large percentage of tannin matter contained in the fibre, it is necessary when dyeing with Diamine Colours to add 0.25—0.5% soda, and for standing baths further to add 1.5—2% ammonia 0.960 spec. gravity.

Black is the colour most asked for in the case of fibre and sisal, and for this purpose Oxy Diamine Black JEI, JE, JB, JW, AM, AT, 700J, 552Z and OJEG may be used either by themselves or in combination with logwood extract according to the following directions:

Charge the starting bath with 2% ammonia and ¼—½% soda ash, then add 2—3% dyestuff previously well dissolved with condense water, and finally about 5% Glauber's salt crystals. Boil the liquor up well, enter the material, work for 5 to 10 minutes, cover up with a lattice-work cover weighted with stones, boil for ½ to 1 hour, and allow to feed for ¼ to ½ hour in the cooling bath. Hereafter lift the fibre, rinse, and dry.

When dyeing fibre for brushes etc. requiring good penetration, it is best to use a combination of 2—3% Oxy Diamine Black and 2—4% logwood extract.

Dye as indicated, boiling however for 1½ to 2 hours varying with the thickness of the fibre, then lift the material, allow it to lie for several hours exposed to the air, hereafter enter into another bath of 30—40° C. (85—105° F.) charged with pyrolignite of iron of 4° Tw., leave herein for ½ to 1 hour, and leave again for several hours exposed to the air, rinse thoroughly, and dry.

If patent fibre and lustre fibre are to be produced, the method of working is exactly the same as described in the previous pages, the goods being taken finally through a bath heated to 60—70° C. (140—160° F.), charged as follows:

10 gallons liquor
2 lbs gelatine size
2 lbs logwood extract
½ lb fustic extract
½ lb pyrolignite of iron.

Work the goods in this bath for 30 minutes, allow to drain off, and brush with suitable brushing machines until dry. If the fibre is not to be polished, 8 oz whitening per 10 gallons liquor are added to the bath of pyrolignite of iron.

For the dyeing of piassava and manila hemp, any of the dyestuffs used for jute may be employed; Basic Colours in particular are suited for this purpose, amongst which Piassava Brown KB is specially to be mentioned as yielding a good Brown on piassava.

Regarding the dyeing of kapok, see the directions on page 95.

DYEING OF HUMAN HAIR.

Human hair as imported from China, Japan and Russia is usually black, and has to be bleached before it is possible to obtain fair shades on it for plaits and other similar articles.

Bleaching. This is mostly continued until the hair has assumed a blonde colour.

The hair, which as a rule is in a very dirty state, is first of all treated with 8 oz potash, ½—1 lb sodium perborate and 1—2 lbs soap per 10 gallons liquor. Dissolve the perborate in water of about 20° C. (68° F.), add the potash dissolved in water, and finally the soap; enter the hair into this bath, and raise the temperature gradually to about 50° C. (120° F.); then leave the hair for 10 to 12 hours in the cooling bath, lift, allow to drain off, and rinse in soft water. The hair at this stage possesses a chestnut brown colour.

The hair is now bleached further with hydrogen peroxide, sodium peroxide or sodium perborate. Bleaching with the two first-named bleaching agents is carried out in the same manner as stated on pages 130, 131 and 132; the bath should however be charged with an increased quantity of peroxide of hydrogen, as a rule containing 1 part peroxide of hydrogen of 10—12 volume percent and 2 parts water or the corresponding quantities of sodium peroxide, acid and water.

The bleaching with sodium perborate is carried out in the following manner:

Dissolve 1½—2 lbs sodium perborate in 10 gallons water of about 20° C. (68° F.), add enough sulphuric acid to make the bath react slightly acid, i. e. to redden blue litmus paper faintly, then render the

bath slightly alkaline by the addition of some ammonia until red litmus paper is only just turned blue. Enter the thoroughly washed hair into the bath heated to about 30° C. (85° F.), raise the temperature to 70—75° C. (160—165° F.) and leave the material immersed in this bath for one or two days.

After the bleaching the hair is soured off for a few hours with 10 lbs nitric acid of 66° Tw. per 10 gallons, rinsed in clear water, and dried at a moderate temperature.

Chinese and Japanese hair are frequently subjected to a special treatment in order to reduce the hair in diameter, and thus give it the appearance of European hair. This treatment is carried out between the bleaching and souring off with nitric acid, by immersing the hair in a chloride of lime solution of 0.2—0.3° Tw. for about two days. This bath renders the hair thinner and imparts to it a higher lustre. The hair is then rinsed thoroughly, soured off with nitric acid, rinsed again in clear water, and dried at a moderate temperature, whereupon it is ready for dyeing.

Dyeing. This follows the bleaching and reducing (if resorted to). For dyeing, Acid Colours are chiefly used, such as

Cyanole Green B, 6G
Acid Yellow AT
Orange GG
Lanafuchsine SG
Azo-Orseille BB.

The following yield shades of very good fastness to light:

Alizarine Cyanole EF
Fast Acid Yellow TL
Orange GG
Brilliant Lanafuchsine BB, GG.

If in addition to excellent resistance to light it is important that the colour should be exceedingly fast to wear, perspiration and washing, Anthracene Chromate Colours should be employed, in the first place:

Anthracene Chromate Brown ER, 3G
Anthracene Yellow BN
Anthracene Chromate Grey KB
Alizarine Brilliant Green G.

Dyeing Directions for Acid Colours. Dye with the addition of 5% Glauber's salt crystals and 1% sulphuric acid; enter the hair at about 40° C. (105° F.), raise to boiling temperature, dye for ¼ hour at the simmer, and then rinse well.

Dyeing Directions for Anthracene Chromate Colours. Heat the bath to about 40° C. (105° F.), add the requisite dyestuff well dissolved previously in boiling water, and just before entering the hair the requisite quantity of bichrome (half of the weight of the dyestuff but not less than 0.25% bichrome) well dissolved; enter the material, raise to boiling temperature, and after ½ hour's dyeing add 2—3% acetic acid of 8° Tw. in order to exhaust the bath. Finally rinse thoroughly.

DYEING OF NATURAL FLOWERS, LEAVES, GRASS ETC.

Natural, freshly cut flowers are but seldom dyed by dipping them into a dyestuff solution; on the other hand their capillary action is frequently utilized in order to produce different shades particularly in the case of white and light coloured flowers, by allowing them to absorb colour solutions, by which means peculiar effects are produced.

For this purpose easily soluble Acid Colours are principally employed for instance for

Red: Acid Magenta
Brilliant Lanafuchsine SL.

Blue: Cyanole extra
Tetra Cyanole V.

Green: Acid Green extra conc.

Yellow: Fast Acid Yellow 3G.

Orange: Orange GG, extra.

Violet: Acid Violet 6BS, 4RS.

Prepare very dilute solutions of these dyestuffs with pure water without any additions, and put the freshly cut flowers with their stems into the solutions.

The only kind of dried flowers which are usually dyed are the various kinds of everlasting flowers which are as a rule white or yellow naturally.

For dyeing these materials, as well as leaves and grasses, Basic Colours in aqueous solutions come principally into consideration, the following products being particularly well suited:

For Yellow and Orange:

Thioflavine T, TCN
Paraphosphine G, R
Chrysoïdine Crystals.

For Pink and Red:

Irisamine G
Safranine S No. 150
Magenta Ia
Cerise Ia, N.

For Violet:

Methyl Violet, all brands
Crystal Violet 10B.

For Blue:

Methylene Blue BB
Victoria Blue B.

For Green:

Brilliant Green Crystals extra
Solid Green Crystals O
shaded with
Thioflavine T.

For Brown:

Bismarck Brown EE.

For Black:

Jute Black 8184, 9375
Tannin Leather Black M
Black for Artificial Silk GN.

Dye in boiling hot water with the addition of some acetic acid, rinse well, immerse for some time into a glycerine solution of 1—2 lbs per 1 gallon water, or in a magnesium chloride or calcium chloride solution of about 15° Tw. to which some oil emulsion or monosolvol is added, and dry cold.

Material which absorbs the dyestuff with difficulty is to advantage mordanted before dyeing by immersion for several hours in a lukewarm tannic acid bath (2—5% tannic acid of the weight of the material), then treated cold with 1—2% antimony salt, rinsed, and dried.

In addition to these Basic Colours a few Acid Colours may also be employed for dyeing everlasting flowers, viz:

For Pink:

Eosine GGF
Erythrosine D.

For Red:

Brilliant Croceïne, all brands.

For Blue:

Victoria Blue
Pure soluble Blue.

For Orange:

Orange ENZ.

Dye in a fairly concentrated bath (4—8 oz dyestuff) and with the addition of 4—8 oz alum per 10 gallons liquor, then dry without rinsing; in the case of the Eosine brands, 1—2 lbs common salt per 10 gallons liquor are used in the place of alum.

The production of light shades is of course possible only if the material has been bleached well previously. Directions for bleaching will be found on page 137.

DYEING OF MATERIAL FOR ARTIFICIAL FLOWERS.

Cotton, silk, half-silk fabrics and velvet are used as materials for this industry.

In certain instances, for exceedingly brilliant shades, the piece-dyed materials are demanded; the dyestuffs in use for piece-dyeing will be found in the previous chapters on cotton, silk or half-silk dyeing.

In most cases, however, the materials in the raw state are punched to the desired shape and dyed by the flower makers themselves. Dyestuffs soluble in alcohol are used for this purpose in the first place, but dyestuffs dissolved in water may likewise be employed, the solution of which is diluted with an equal quantity of alcohol in order to expedite the drying.

The following dyestuffs soluble in alcohol are mostly employed for this purpose:

For Yellow and Orange:

Auramine O
Thioflavine T, TCN
Chrysoïdine crystals.

For Pink and Red:

Irisamine G extra
Safranine S No 150
Magenta Ia Dia.

For Violet:

Methyl Violet, all brands
Crystal Violet 10B
Tannin Heliotrope.

For Blue:

Victoria Blue B
New Methylene Blue GG
Indazine soluble in spirits.

For Green:

Brilliant Green Crystals extra
Solid Green Crystals O
in combination with the above-mentioned yellow dyestuffs.

For Grey and Black:

Lake Black C
Nigrosine soluble in spirits.

According to the shade to be produced, dissolve 1½—16 oz dyestuff per 1 gallon alcohol, and dip the ready punched fents in small packages into the cold solution, press off lightly, and dry.

Of dyestuffs soluble in water, chiefly Acid Colours are used for producing bright shades, in the first place the following:

For Pink and Red:

Eosine GGF
Erythrosine extra N
Rose Bengale extra N
Rosazeïne B
Brilliant Croceïne, all brands.

For Yellow and Orange:

Acid Yellow AT
Indian Yellow FF
Metanil Yellow
Orange extra, ENZ.

For Blue:

Victoria Blue B, R
Pure Soluble Blue
Water Blue, all brands.

For Violet:

Formyl Violet S4B.

For Green:

Brilliant Milling Green B
Naphtol Green B.

As stated already, these products are dyed in aqueous solutions diluted with an equal weight of alcohol in order to accelerate the drying; it is an advantage moreover to add some alum (3—4½ oz per 10 gallons).

Also in this instance the method of working is the same, viz, the punched fents are dipped into the more or less concentrated colour solution.

Two-coloured effects are produced by dipping light-coloured material subsequently into a solution of a darker or complementary colour and then drying again; or the colouring is effected by spraying (by means of the aerograph) alcoholic colour solutions on to the material; in this manner very pleasing effects may be produced.

The dyeing is often effected also by the application of colour lakes thickened with a starch paste; regarding the production of colour lakes see the chapter dealing with this subject matter.

DYEING OF WOOD FOR CABINET WORK, FURNITURE, FANCY GOODS, MATCHES ETC.

I. SURFACE DYEING.

For this purpose colour solutions are brushed on either hot or cold, or the material to be dyed is immersed in the dye liquor.

For producing bright shades regarding which no special demands are made in point of fastness to light, *Basic Colours* come in the first place into consideration, while for best possible fastness to light, the fastest of the *Acid Colours*, and in certain cases also *Diamine Colours*, should be used. For certain kinds of work, dyestuffs soluble in spirits are likewise employed.

The following *Basic Colours* are suitable:

Safranine, all brands
Magenta, all brands
Cerise Ia, N
Thioflavine T
Chrysoïdine, all brands
Bismarck Brown, all brands
Tannin Brown B
New Methylene Blue N, R, GG
Brilliant Green Crystals extra
Solid Green Crystals O
Methyl Violet, all brands
Crystal Violet 10B
Jute Black 8174, 9375, GN.

Almost any of the *Acid Colours* may be used, but the following are particularly well suited:

Fast Acid Yellow 3G
Acid Yellow AT
Indian Yellow FL

Fast Yellow S
Tropaeoline G
Orange extra, EN, GG
Rosazeïne B
Brilliant Croceïne, all brands
Formyl Violet S4B
Pure Soluble Blue
Solid Blue R, 3R
Brilliant Milling Green B
Acid Green extra conc., 5G
Cyanole Green B
Naphtol Blue Black BN
Nerazine G, BR.

The following *Diamine Colours* may be employed:

Diamine Fast Yellow A, B, AR 200%
Diamine Yellow KCP
Diamine Orange B
Diamine Fast Orange EG, ER
Diamine Scarlet B
Diamine Fast Scarlet, all brands
Diamine Fast Red 8BL
Diamine Fast Bordeaux 6BS
Diamine Violet N
Diamine Brown 3G, R, M
Diamine Fast Brown G, R, GB
Diamine Sky Blue, FF
Diamine Blue 3B, BX
Diamine Fast Blue G, FFB, FFG
Diamine Green B, G
Diamine Black BH, HW
Oxydiamine Black JEI, JB, JW
Diamine Fast Black C high conc., GV extra conc.

In addition to the dyestuffs soluble in spirits enumerated in the section dealing with spirit varnishes, the following products may also be employed:

Spirit Yellow Brown 4389J
Spirit Dark Brown 4390J
Spirit Brown 2591J, KM
Spirit Oxblood 4391J
Spirit Maroon 4392J
Spirit Green 4385J
Spirit Olive Green 4386J

Indazine soluble in Spirits
Black soluble in Oil III
Cerasine Yellow I, AT
Cerasine Blue I
Cerasine Violet I
Cerasine Rose I
Cerasine Red II
*Cerasine Red I
*Cerasine Dark Red I, II
*Cerasine Orange G, I
*Cerasine Brown.

Directions for Dyeing by Brushing on Colour Solutions.

Of the Basic, Acid and Diamine Colours soluble in water solutions of 1—2½ lbs dyestuff in 10 gallons water are brushed on once or several times over, either warm or cold, by means of a paint brush. Basic Colours require for dissolving an addition of about an equal quantity of acetic acid as of dyestuff.

The dyestuffs soluble in spirits are dissolved as indicated in the section dealing with Spirit Lakes, and used with or without the addition of spirit varnish.

The Cerasine Colours may be dissolved in the same manner in alcohol heated to about 40° C. (105° F.); of the products marked with an asterisk (*) not more however than 3—4½ oz per 10 gallons should be dissolved.

Every solution should be filtered before use.

Directions for Dyeing by Immersion in the Dyebath.

Dissolve 3—8 oz dyestuff per 10 gallons liquor, and immerse the material to be dyed for 1 to 6 hours in the cold or hot dyebath. The longer the dyeing operation and the hotter the dye-liquor, the better will be the penetration of the colour into the wood. For Diamine Colours add ½—1 lb desiccated Glauber's salt per 10 gallons liquor.

Matches are generally dyed with Basic Colours, but frequently also with Rosazeïne B and Orange EN, by immersion in the dyebath.

II. DYEING OF WOOD BY PENETRATION.

For dyeing wood completely through, a result which cannot be attained by a mere immersion in dyebaths, cylindrical iron apparatus are frequently used charged with colour solutions in which the immersed pieces of wood are subjected at ordinary temperature for 2 to 12 hours to a pressure of 80 to 120 atmospheres; the higher the pressure, the more satisfactory will be the penetration. In certain instances the material before dyeing is leached with boiling water under pressure, and sometimes it is dyed boiling hot.

Whole logs may be dyed through by fitting the straight cut log hermetically to an apparatus by means of which the colour solution is pressed through the wood in the direction of the fibre i. e. lengthways; in order to allow of a more rapid working, the passing of liquor under pressure may also be reversed, i. e. applied the opposite way, thus working alternately for some time first one way and then reversing the circulation of the liquor.

Wooden beams are frequently also dyed by expelling the air by means of a vacuum and then sucking or pressing the suitably prepared colour solution through the log.

Easily soluble Acid Colours or even Basic Colours may be used for dyeing; the following Acid Colours are to be recommended:

Acid Yellow AT
Fast Acid Yellow 3G
Orange extra, GG
Brilliant Croceïne, all brands
Brilliant Lanafuchsine BB, GG, SL
Formyl Violet 4BF
Pure Soluble Blue
Solid Blue R, 3R
Cyanole FF, extra
Acid Green extra conc., 5G
Brilliant Milling Green B

Naphtol Green B
Havana Brown S conc.
Brown 3667J
Naphtol Blue Black, BN.

Of the Basic Colours, the following come into consideration:

Diamond Phosphine GG, R, D, PG
Chrysoïdine R crystals
Bismarck Brown EE, GG, PS, PSE
Safranine S No 150
New Magenta O
Solid Green Crystals O
Methyl Violet BB 72 No 1, R No 1, 3R No 1
Methylene Blue BB
New Methylene Blue N, R
Jute Black 9375, GN.

Directions for Dyeing by means of Compressed Air Apparatus.

Dissolve the dyestuff in boiling hot water, and when still somewhat warm press the solution into the wood in the manner afore described.

The dyed wood is rinsed a little with cold water and dried by exposure to the air or in moderately warm rooms.

DYEING OF CELLULOID GOODS AND CELLULOID FILMS.

Celluloid is dyed sometimes during the manufacture and partly in the finished state.

In the first instance Aniline Colour lakes (regarding their production see the chapter on colour lakes page 185) are used in addition to mineral colours, both of which are admixed to the celluloid mass when still soft.

Celluloid articles and celluloid films, the latter when desired to show as good a penetration as possible, are dyed with the following colours soluble in spirits.

Naphtaline Yellow Crystals
Tropaeoline G 120%
Chrysoïdine Crystals Powder
Bismarck Brown GG 125%
Rosazeïne B extra
Irisamine G extra
Safranine S No 150
Brilliant Green Crystals extra
Spirit Blue B, R
Crystal Violet 5BO
Methyl Violet KB No 0
Nigrosine extra soluble in spirits
Lake Black C, 4521J.

Directions for Dyeing.

These dyestuffs are dissolved at 60—70° C. (140—160° F.) in alcohol of 95—98%.

The dyeing is effected by spraying on or pouring the well filtered colour solution over the goods, or by dipping the goods into or passing them through the solution.

After dyeing, it is advisable to rub the dyed material with a little grease (vaseline etc.), especially in the case of deep shades.

If merely the gelatine surface of developed films is to be dyed, the following dyestuffs soluble in water may be used:

Fast Acid Yellow 3G
Orange GG, ENL
Brilliant Croceïne, all brands
Brilliant Lanafuchsine BB, GG, SL
Lanafuchsine 6B
Azo Wool Violet 7R.
Pure Soluble Blue
Cyanole FF
Tetra Cyanole V
Naphtol Green B
Paper Yellow A high conc.
Diamine Fast Orange EG, ER
Diamine Fast Brown G, R, GB
Diamine Fast Red 8BL.

The dyestuffs are dissolved in boiling hot water, the concentration of the solution depending on the depth of shade required. The dyeing is carried out either without any acetic acid or with the addition of a very slight quantity, the material being passed slowly through the cold colour solution, and dried.

DYEING OF MATERIAL FOR THE MANUFACTURE OF BUTTONS.

Vegetable Ivory, Horn, Ivory, Mother of Pearl, Galalith, Bakelite.

The materials which are used most in the manufacture of buttons are *vegetable ivory*, *horn*, *ivory*, *mother* of *pearl*, and certain artificial materials such as *galalith* and *bakelite*. Buttons are best dyed in the wrought state, so that a slight polishing is all that is needed after the dyeing is complete.

For the dyeing of *vegetable ivory buttons* for mode colours, deep reds, claret, green and brown shades, as well as for blacks, Diamine and Diamine Fast Colours are principally employed, whilst for very brilliant shades Basic Colours are preferred. The Diamine Colours give shades of very good fastness to rubbing, Basic Colours being on the other hand distinguished particularly for very good penetrating properties.

Amongst the *Diamine Colours*, any of which may be employed, the following are particularly to be recommended:

Diamine Fast Yellow B, FF
Diamine Fast Orange EG, ER
Diamine Orange G, D
Diamine Fast Brown G, R, GB
Diamine Catechine G, B
Diamine Brown M, B, R
Diamine Green B, G
Diamine Red 4B, 6B, 10B
Diamine Bordeaux B
Diamine Violet Red
Diamine Bengal Blue G, R
Diamine Fast Blue FFB, FFG
Diamine Fast Red F, 8BL
Diamine Fast Bordeaux 6BS
Diamine Fast Violet FFBN
Diamine Fast Scarlet 4BFF, 7BFF
Diamine Fast Grey BN, RN
Diamine Dark Blue B
Oxydiamine Black JE, JEI, JB, JW.

Dye for about one hour at the boil with the addition of ¾ oz soda ash and ½—1 lb Glauber's salt crystals per 10 gallons liquor, then allow the goods to cool off a little in the bath, and rinse.

Of the *Basic Colours*, the following are particularly well suited:

Thioflavine T
Chrysoïdine, all brands
Paraphosphine G, R
Safranine, all brands
Magenta, all brands
Tannin Heliotrope
Methyl Violet } all brands
New Methylene Blue }
Indazine M
Jute Black 8174, 9375.

Dye boiling with the addition of 3—8 oz acetic acid 8° Tw. per 10 gallons liquor, rinse, and dry.

Acid Colours may be used for dyeing *horn buttons*, but as they require severe boiling in order to go on to the material, it may easily happen that the buttons are softened at boiling heat and altered in shape so that they have to be shaped over again, whereby the dyeing, which is principally on the surface, is affected considerably.

It is thus to more advantage to work with Basic Colours, which exhaust at a lower temperature and do not affect the material. The goods are dyed for 3 to 6 hours at 50—60° C. (120—140° F.) with Basic Colours as recommended for vegetable ivory buttons and the addition of 2—5% acetic acid per 10 gallons liquor.

For covered shades and mode colours the dyeing may be done cold by using the Furrol Colours, by which means damage to the material, which is always liable to occur when dyeing in a hot liquor, may be avoided. The dyeing may be carried out either with or without a previous mordanting of the material, but as a rule it is better to mordant, because mordanting is conducive to a better fixation of the dyestuff. The following Furrol brands come into consideration:

For Black: Furrol S, PM; the "S" brand yields a brownish black and "PM" a deep blue-black.

Brown: Furrol B.

Dark Brown: Furrol B in combination with Phenylene Diamine Powder.

Yellow-Brown: Furrol Yellow Brown G.

Grey: Furrol Grey G, R.

As a mordant, copper sulphate or copperas are as a rule used, both of which yield approximately the same effect; for more covered shades, bichrome is used. The mordanting is carried out as follows:

Dissolve 4—6 oz of the metal salt in 10 gallons of warm water free from lime, allow the solution to cool, and enter the material to be mordanted. Leave the goods for 6 to 8 hours in this mordant, working them frequently in order to have every portion come evenly into contact with the mordanting liquor; hereafter rinse well in cold water.

The dyeing is carried out in the following manner:

Dissolve the quantity of Furrol necessary for the desired depth of shade (1½—6 oz per 10 gallons) in boiling hot water, and allow the solution to become cool. Then add 12—15 times the weight of hydrogen peroxide (12 vol. percent) as of dyestuff used, and enter the material into this solution, leaving it therein until the shade is completely developed (about 6 hours). The dye-liquor may be slightly acidified with acetic or formic acid if this should appear necessary in order to better fix the dyestuff. During the dyeing the goods must be shaken up frequently. When the dyeing is complete, wash the material well, and treat it in a weak soap solution if necessary; in the latter case the goods are to be treated for a short time in water feebly acidulated.

Ivory (buttons, billiard balls, etc.) are dyed in the same way as horn.

Mother of pearl may be dyed with dyestuffs soluble in water, more particularly with Basic Colours. As a rule, a considerable amount of alcohol is added to the aqueous solutions, or the dyeing is done in alcoholic solutions, mother of pearl being stained more easily in alcoholic solutions than in aqueous solutions.

The following dyestuffs are used for the purpose:

Auramin O, II
Thioflavine T, TCN
Chrysoïdine, all brands
Irisamine G, G extra
Safranine S No 150, G extra O, B extra O
New Magenta O
Bismarck Brown GG, EE
Brilliant Green Crystals extra
Malachite Green conc.
Solid Green Crystals O
Methylene Blue BB
New Methylene Blue N, R, 3R
Methyl Violet BB72 No 0, R No 1, 3R No 1.
Jute Black 9375J, GN.

Before the actual dyeing, immerse the material in a potash solution (1:10) of about 50° C. (120° F.), hereafter wash it well in plain water, and dry. Then enter the material into the colour solution, and leave it therein until completely dyed. The concentration of the colour solution is regulated by the depth of shade desired. After dyeing, rinse thoroughly in cold water, and dry gradually. Better results are frequently obtained by mordanting with nitrate of silver after previously cleaning the material with potash.

For artificial material, so-called *Galalith* (a material prepared by treating caseïne with formaldehyde), it is best to use Diamine Colours as

recommended above for vegetable ivory buttons, or Acid Colours, and to dye at 80—90° C. (175—185° F.).

Bakelite (a material obtained by condensation of certain phenols with formaldehyde) is best dyed with Basic Colours such as are used for vegetable ivory buttons, the metod of dyeing also being the same.

PART III.

Colour Lakes (Pigment Colours).

Spirit Varnishes.

Dyestuffs for Ink.

Dyestuffs for Typewriter Ribbons.

Dyestuffs for Soap.

Dyestuffs for Wax, Candles, Fats, etc.

Leather Finishes.

COLOUR LAKES (PIGMENT COLOURS).

These are produced by precipitating dyestuffs on to suitable bases according to the directions given below.*

The most important bases for such purposes are barytes, aluminium hydrate, and for Basic Colours in particular white fixing clay, China clay and green earth. The principal precipitating agents to be considered are barium chloride, salts of lead, tannic acid and resin soap.

Aluminium hydrate is produced by mixing the solutions, heated to about 70° C. (160° F.), of

3 lbs sulphate of alumina in
3 gallons water and
1½ lbs soda ash in
1½ gallons water.

Add the soda solution to that of sulphate of alumina whilst stirring, allow to settle, wash, filter, and finally press off if necessary.

Name of Dyestuff	Method to be employed	Particulars of Method
I. ACID COLOURS.		**Method I.**
Red:		60 lbs sulphate of alumina (1:20) are mixed with 20 lbs soda ash (1:20); 100 lbs barytes are then added and thereupon 15—30 lbs dyestuff (1:100) which are precipitated finally at 30° C. (85° F.) with 75—90 lbs barium chloride (1:20). This method is suitable for lakes for coloured papers and superior qualities of wall-papers.
Excelsior Lake Scarlet JN, 2JN	I—IV	
Lake Scarlet GG, R, RR, 3R	I—IV	
Scarlet FR, EC	I—IV	
Brilliant-Croceïne, all brands	I—IV	
Croceïne AZ	I—IV	
Erythrine C	III, IV	
Diamine Brilliant Scarlet S	Ib—IV	

* The dyestuffs are as a rule employed in a solution of 1:100, sometimes also 1:50, the other additions being used in a solution of 1:20 as indicated in brackets in the recipes.

Name of Dyestuff	Method to be employed	Particulars of Method
Claret and Violet:		**Method Ia.**
Bordeaux BL	I—IV	24 lbs sulphate of alumina (1:20) are mixed with
Amaranth B	I—IV	12 lbs soda ash (1:20).
Lanacyl Violet BF	I—IV	100 lbs barytes are then added and
Formyl Violet S4B.	I—IV	10—25 lbs dyestuff (1:100), which is precipitated at 30° C. (85° F.) with
		105 lbs barium chloride (1:20) and the whole precipitated again with
		30 lbs sulphate of alumina (1:20 hot) and
		10 lbs soda ash (1:20).
Blue:		
Pure Soluble Blue	I—IV	More satisfactory waste waters result when applying this method, which is particularly to be recommended for Naphtol Green B, Acid Green extra conc., Cyanole extra, FF, Fast Acid Yellow 3G and China Yellow B.
Water Blue B	I—IV	
Blue JBP	I—IV	
Alkaline Blue, all brands	I—IV	
Tetra Cyanole A	I—IV	
Cyanole FF, extra	Ia,III,IV,V	
Lake Blue CB	V	
Lanacyl Blue BN, RN	I—IV	
Peri Wool Blue G	I—IV	**Method Ib.**
Diamine Sky Blue FF*	I—IV	75 lbs sulphate of alumina (1:20) are mixed with
Diamine Blue RW*	I—IV	35 lbs soda ash (1:20) and charged with
Oxy Diamine Blue 5G*	I—IV	100 lbs barytes. Then
Brilliant Milling Blue B	I—IV	10—25 lbs dyestuff (1:100) are added and precipitated with
		90 lbs barium chloride (1:20) at 30° C. (85° F.).
		This method is especially suitable for Diamine Colours.

* In order to increase the fastness to light of the dyestuffs marked with an asterisk (*), their lakes are to advantage treated with sulphate of copper by adding to the freshly precipitated lake a solution of sulphate of copper 1:10 (about half or the same weight as of dyestuff), allowing to stand for a little while, and finally washing, pressing, and drying in the ordinary manner.

Name of Dyestuff	Method to be employed	Particulars of Method
Green:		**Method II.**
Acid Green extra conc.	Ia, III, IV	100 lbs barytes are mixed to a paste with
Lake Green BW	I—IV	6 lbs soda ash (1:20); then
Naphtol Green B.	Ia, V	10 lbs dyestuff (1:100),
		20 lbs barium chloride (1:20) and
		13 lbs sulphate of alumina (1:20) are added consecutively.
Yellow and Orange:		This method is a little cheaper than Method I; somewhat brighter lakes are obtained by Method I.
Orange extra, ENL, RL, RRL, GR special	I—IV	
Croceïne Orange X	I—IV	**Method III.**
Indian Yellow, all brands	I—IV	20 lbs sulphate of alumina (1:20) are mixed with
Diamine Fast Yellow A, AR	I—IV	10 lbs soda ash (1:20),
Milling Yellow O	I—IV	10 lbs dyestuff (1:50) being then added. The whole is precipitated with
Naphtol Yellow S, SL	I—IV	25—30 lbs barium chloride (1:20).
China Yellow B	I—IV	This method is used for coloured paper and cheap lithographic inks.
Fast Acid Yellow 3G	Ia—IV	
Diamine Fast Yellow FF300	Ib—IV	**Method IV.**
Paper Yellow A high conc.	Ib—IV	150 lbs aluminium hydroxide 10% are mixed with
Paper Yellow GG extra	Ib—IV	10 lbs dyestuff (1:50) and precipitated with
Lake Fast Yellow RN.	I—IV	10—15 lbs barium chloride (1:20).
Brown:		This method is suited for fine lithographic inks.
Acid Brown D	I—IV	
Oxy Diamine Brown G, RN	Ib—IV	**Method V.**
Diamine Brown M*	Ib—IV	60 lbs sulphate of alumina (1:25) are precipitated with
Diamine Fast Brown G, R.	Ib—IV	30 lbs soda ash (1:20) and mixed with
Black:		100 lbs barytes; wash three times over, add
Naphtol Black B, 3B, 6B, L115	I—IV	15—30 lbs dyestuff (1:50) and precipitate with
Diamine Jet Black SS	Ib—IV	12½—25 gallons basic acetate of lead of 52° Tw.
Para Diamine Black BB extra conc.	Ib—IV	This method when employed with Naphtol Green B, Tetra Cyanole V, Cyanole FF, extra, and Lake Blue CB, yields very full lakes suited particularly for wall-papers.
Oxy Diamine Carbon JEI	Ib—IV	
Benzazine BR.	I—IV	

* See foot-note on page 186.

Name of Dyestuff	Method to be employed	Particulars of Method
B. EOSINE COLOURS.		**Method VI.**
Eosine 3G	VI	50 lbs sulphate of alumina (1:20) are mixed with 25 lbs soda ash (1:20) and; 80 lbs barium chloride (1:20); after washing 3 times 100 lbs barytes are stirred in. Add 24 lbs dyestuff (1:50) cold, and precipitate with a cold solution of 30 lbs acetate or nitrate of lead (1:20).
GGF	VI	
BN	VI	
L	VI	
Rose Bengale extra N.	VI	
C. BASIC COLOURS.		**Method VII.**
Red:		100 lbs barytes and 50 lbs China clay are mixed to a good paste, then 5 lbs dyestuff (1:100) are added and precipitated with a warm solution of 7.5 lbs tannic acid and 7.5 lbs acetate of soda in 30 gallons water.
Safranine G extra O, B extra O, GG extra O, S No 150	VII—IX	
Magenta Ia Dia.	VII—IX	
New Magenta O	VII—IX	
Irisamine G	VII—IX	
Rosazeïne 6G, B.	VII—IX	
		By adding 3—4 lbs tartar emetic or antimony salt (1:20) after the tannic acid, a still better precipitation is obtained; it is then unnecessary to add acetate of soda.
		This method is applicable to advantage for the Basic Colours mentioned under C.
Violet:		
Methyl Violet BB 72 No 0, 3BO, 5BO, 6BO	VII—IX	**Method VIIa.**
Crystal Violet 5B bluish, 10B	VII—IX	180 lbs sulphate of alumina (1:20) are precipitated with 90 lbs soda ash (1:20) and stirred up with 100 lbs barytes; wash 3 times, add 20 lbs dyestuff (1:100), and precipitate with 80—100 gallons resin soap (produced by boiling 100 parts resin, 26 parts soda ash and 500 parts water) and 30 lbs white vitriol (1:20).
Fast Neutral Violet B in paste.	VII—IX	
Blue:		
New Methylene Blue N, GG	VII—IX	
Methylene Blue BB.	VII—IX	
		This method is applicable to advantage also for the Basic Colours mentioned under C, and yields very bright lakes.

Name of Dyestuff	Method to be employed	Particulars of Method
Green:		**Method VIII.**
Solid Green Crystals O	VII—IX	100 lbs green earth are mixed with water, and
Brilliant Green Crystals extra.	VII—IX	2 lbs dyestuff dissolved in 40 gallons water are added.
		The dyestuff becomes fixed without any precipitating agent.
		This method is applicable for Basic Colours and yields lakes of very good fastness to light and lime, but not quite so bright as those produced according to Method VII; it is especially valuable for
Yellow and Orange:		
Thioflavine T, TCN	VII—IX	*Solid Green* and *Brilliant Green*
Auramine O, II	VII—IX	and also for
Chrysoïdine Crystals, AG, FF	VII—IX	*Magenta, Methyl Violet, Methylene Blue, Auramine* and *Chrysoïdine,*
Tannin Orange R, powder.	VII—IX	which latter yield, if white fixing clay is used in place of green earth, very bright lakes of very good fastness to lime.
Brown:		
Bismarck Brown GG, EE.	VII—IX	**Method IX.**
		Lakes produced according to Methods I—IV and X may be shaded and brightened by topping with Basic Colours. For instance, the freshly precipitated lake produced according to Method I is washed, and
		5—10 lbs basic dyestuff (1:50) are added, the whole being precipitated with
		6—15 lbs tannic acid 6—15 lbs acetate of soda } in 10—30 gallons water.
		Frequently the Basic Colours are added immediately after the Acid Colour, both being precipitated with barium chloride according to Methods I—IV.

D. PARANITRANILINE RED AND NITROTOLUIDINE ORANGE.

Method X.

a) 4¾ lbs Paranitraniline C are dissolved in
2½ gallons hot water and
13¼ lbs hydrochloric acid of 32° Tw. This solution is poured into 6½ gallons cold water, the whole being then allowed to cool off to 15° C. (60° F.). Hereafter a cold solution of
2½ lbs nitrite of soda in 2½ gallons water is added in one lot whilst stirring, the whole being diluted to 25 gallons with cold water.

When using Nitrazol CF, the solution is prepared as follows:

a) 25 lbs Nitrazol CF are dissolved in
25 gallons cold water, and filtered.

b) 5 lbs Beta Naphtol are dissolved with
5 lbs caustic soda lye 77° Tw. and
5 lbs soda ash in about 5 gallons water;
3 lbs Turkey-red oil are added, and finally
250 lbs barytes with the addition of a sufficient quantity of cold water, about 20 gallons.

The diazo solution (a) is run into (b) whilst stirring well. The colour lake forms immediately, and, after washing out well twice over, is pressed and dried.

A brilliant red lake is obtained in this manner possessing excellent fastness to light, water and lime and good tinctorial power.

By substituting up to 8% of the amount of Beta Naphtol used with Red Developer C (i. e. 4 lbs 10 oz Beta Naphtol plus 6 oz Red Developer C), a lake of considerably bluer shade and of equally good fastness may be obtained.

If the Paranitraniline C in the above directions be substituted by 5 lbs 6 oz *Nitrotoluidine C*, a brilliant orange lake is obtained possessing the same properties of fastness as the Paranitraniline Red lake.

E. MINIUM SUBSTITUTE C.

This dyestuff is ground for a short time in the dry state in a crushing-mill together with the substrate, whereupon the lake is ready for use.

In the following are a few examples of the

PRODUCTION OF IMPORTANT LAKES.

Imitation Chrome Yellow:

75 lbs sulphate of alumina in solution are mixed with a warm solution of
35 lbs soda ash, and then stirred to a paste with
100 lbs barytes, whereupon the solutions of
20—25 lbs Milling Yellow O and
90 lbs barium chloride crystals are added successively.

The lake is very fast to light and lime.

The following is a more greenish *imitation of chrome yellow:*

80 lbs alum are mixed with
25 lbs soda ash and stirred up with
100 lbs barytes. Then the solution of
30 lbs China Yellow B or Fast Acid Yellow 3G and
2½ lbs Auramine O is added, the colour being precipitated with a solution of
130 lbs barium chloride crystals.

The lake is just about as fast the preceding one.

Imitation Chrome Orange:

60 lbs sulphate of alumina are precipitated with
20 lbs soda ash and mixed to a paste with
100 lbs barytes.
4—5 lbs Paper Yellow A high conc. are then added and precipitated with
70—80 lbs barium chloride.

Orange-Minium Substitute.

(1) 100 lbs barytes are mixed with a warm solution of
1.5 lbs soda ash, and the solutions of
0.8 1.2 1.5 lbs Orange extra and
1.2 0.8 0.5 lbs Lake Scarlet R are added, and then consecutively those of
4 lbs barium chloride crystals and
3¼ lbs sulphate of alumina.

(2) 2—4 lbs Minium Substitute C are ground for a short time with
100 lbs barytes in a crushing-mill.

Imitation Vermilion.

70 lbs barytes and
30 lbs orange-minium are stirred up with water to a paste, then mixed with
10 lbs Eosine GGF, dissolved in water, the dyestuff being then precipitated with
15 lbs nitrate of lead.

Red Discharge Lake on Indigo:

100 lbs barytes are mixed with the solution of
50 lbs Scarlet 012956J, the solution of
100 lbs barium chloride crystals being added thereto.

The lake so obtained is very brilliant, and resists the cutting bath for the Indigo chromate discharge in cotton printing.

Red Lake on Aniline Black:

30 lbs zinc white are mixed to a paste with
5 lbs Lake Scarlet 3209J in 100 gallons water and precipitated with a solution of
100 lbs common salt in 40 gallons water.

The lake, printed with the addition of acetate of chrome, is very well suited for the production of bright red illumination effects on aniline black.

Ultramarine Substitute:

1) 100 lbs barytes are mixed with a warm solution of
3 — 6 lbs soda ash, then the solution of
2½— 5 lbs Blue JBP is added and successively precipitated with
10 —20 lbs barium chloride crystals
6½ –13 lbs sulphate of alumina.

2) 50 lbs blanc fixe are mixed with
500 lbs aluminium hydroxide 10%; add the solution of
20 lbs Brilliant Milling Blue FF, and precipitate with
6 lbs soda ash
20 lbs barium chloride crystals
13 lbs sulphate of alumina.

Dark Green Fast to Light and Lime:

48 lbs sulphate of alumina are precipitated with
24 lbs soda ash and mixed with
150 lbs barytes; add
45 lbs Naphtol Green B in solution and precipitate with
215 lbs barium chloride crystals; then add
60 lbs sulphate of alumina and
20 lbs soda ash.

Cheap Green of very good Fastness to Light and Lime:

100 lbs green earth are stirred up with water and mixed with
2 lbs Brilliant Green Crystals extra dissolved in water.

The lake forms without the assistance of any precipitating agent.

SPIRIT VARNISHES.

The dyestuffs are rubbed down as finely as possible, and dissolved by pouring spirit varnish over them and shaking them up repeatedly. The solutions are cleared by allowing to settle and decanting. The clear solution is poured over the goods to be dyed, and allowed to run off quickly, whereupon the dyed goods are dried at a moderate temperature.

Red:	Safranine S No 150 Irisamine G extra Rosazeïne B extra Eosine Scarlet B 120% Cerasine Red I, II Spirit Maroon 4392J Spirit Oxblood 4391J.
Violet:	Tannin Heliotrope Magenta Ia. Dia. New Magenta O Methyl Violet BB 72 No 0 Crystal Violet 5B bluish, 10B.
Blue:	Spirit Blue R, B, 3R Indazine soluble in spirits.
Green:	Brilliant Green Crystals extra Solid Green Crystals O Spirit Olive Green 4386J Spirit Green 4385J.
Yellow:	Thioflavine T, TCN Naphtaline Yellow crystals Cerasine Yellow AT, ATG Tropaeoline G 120%.
Orange:	Cerasine Orange I, G Crysoïdine Crystals Tannin Orange R.
Brown:	Bismarck Brown GG 125% Cerasine Brown Spirit Brown 2591J Spirit Brown 2592J
Black:	Nigrosine soluble in spirits extra Lake Black C, 638J, 4521J.

DYESTUFFS FOR INK.

Names of the Dyestuffs	Solubility in hot water	Remarks:
1. Magenta Ia Dia.	1 : 50	The dyestuffs are dissolved by pouring hot condensed water over them, and filtering the solutions.
2. New Magenta O	1 : 25	
3. Solid Green Crystals O	1 : 25	
4. Brilliant Green Crystals extra	1 : 25	
5. Methyl Violet BB 83 No 0, 3BD No 0, 3R No 0	1 : 25	The dyestuffs marked 1—10, 20 and 21 are affected by the action of metallic salts and acids, and are thus suitable only for producing aniline inks, stamping inks, and hectographic inks.
6. Crystal Violet 5B bluish	1 : 25	
7. Rosazeïne B extra	1 : 25	
8. Jute Black 09624 N, 9375	1 : 50	
9. Eosine GGF, L	1 : 25	
10. Eosine Scarlet B	1 : 25	
11. Brilliant Cochineal 2R, 4R	1 : 25	Those marked 11 to 19 resist such agents, and may thus be used both for pure aniline inks and for shading gall-nut inks and so-called alizarine inks (in quantities of $^1/_{10}$ to $^1/_5$ per cent).
12. Cyanole extra	1 : 15	
13. Tetra Cyanole V	1 : 15	
14. Acid Green extra conc., Acid Green extra conc. B	1 : 20 1 : 20	
15. Cyanole Fast Green G	1 : 20	
16. Naphtol Black L 115	1 : 20	
17. Naphtol Blue Black	1 : 25	
18. Pure Soluble Blue 34	1 : 25	
19. Water Blue RS	1 : 25	
20. Nerazine G	1 : 6	
21. Carbon Black 3260J, 4191J	1 : 50	

1. Recipe for Pure Aniline Ink.

$^1/_2$— 2 lbs dyestuff are dissolved with
6— 8 oz gum arabic in
10 gallons water, to which
$^3/_8$—$^1/_2$ pint alcoholic solution of salicylic acid 1:10 are added.
If copying ink is required,
4— 5 lbs glycerine are also added.

2. Black Ink not effaceable with Water.

Solution I. 2½ lbs tannic acid in 1 gallon
2½ lbs copper sulphate in 1 gallon
2¾ pints acetic acid 8° Tw.
4/10 ,, hydrochloric acid 32° Tw.
} are brought up to 10 gallons with water.

Solution II. 2¼ lbs Naphtol Black L 115
¾ pint alcoholic solution of salicylic acid 1:10
} are brought up to 10 gallons with water.

The two solutions are then mixed together.

3. Gall Ink (Alizarine Ink).

23.4	parts	tannic acid
7.7	,,	gallic acid
7.2	,,	hydrochloric acid 32° Tw.
10	,,	gum arabic
30	,,	copperas
1.5—2.5	,,	Aniline Colour
1	,,	carbolic acid or ½ part salicylic acid
937	,,	water.

Dissolve the tannic acid and gallic acid in lukewarm water and the gum arabic in cold water, mixing the two solutions when cold; add the hydrochloric acid, then the copperas dissolved in cold water, and finally the carbolic acid.

The solution resulting is allowed to settle for 4 or 5 days at 15° C. (60° F), and then filtered.

The Aniline Colour is then added to the filtered solution.

Pure Soluble Blue 34 or Blue RS are mostly used with a slight addition of Cyanole extra, Acid Green extra conc. and Naphtol Blue Black.

4. Stamping Ink.

For this purpose the dyestuffs mentioned on page 195 under numbers 1—10, 14, 16, 18, 20 and 21 are best suited.

1—1½ lbs dyestuff are dissolved in
6 ,, glycerine and
3 pints water, in which
2½ lbs gum arabic have previously been dissolved.

DYESTUFFS FOR TYPE-WRITER RIBBONS.

Methyl Violet 4B No 0
Methylene Blue DBB
Safranine G extra No 0
Scarlet for Cotton
Carbon Black 3260J, 4191J
Jute Black 09624N.

These dyestuffs are rubbed down with American vaseline or mineral oil to a fine paste with which the ribbons are impregnated.

Another recipe with glycerine as a basis is as follows:

5 lbs dyestuff are finely suspended in
25 ,, glycerine

by continual rubbing and then dissolved by heating to about 90° C. (195° F.). If some dyestuff should separate during cooling, a little water is added and the whole is heated again.

DYESTUFFS FOR SOAP.

The dyestuff is dissolved in as little water as possible (10—50 times its own weight), if necessary hot with the addition of some spirits of wine and a little caustic soda lye, the solution being added to the soap after having been filtered well.

When the saponification takes place cold (cocoanut soap), the dyestuff solution may be added during such process, but when carried out hot (curd soap, soft soap etc.), the dyestuff solution should not be added until after saponification is complete. It is best to dye the finished soap in the mixing machine, mixing the grated soap with the dyestuff solution until it is perfectly evenly dyed.

Some of the dyestuffs indicated below change their colour when added to the warm soap mass, but their proper shade returns on the soap becoming cool.

The following dyestuffs are the best suited for soap dyeing:

Soap Yellow extra greenish
Fine Soap Yellow TA
Soap Yellow Ia
Fluoresceïne Yellow
Light Orange
Fine Orange A
Brilliant Orange B
Bluish Rose N
Fine Rose B, DS
Brilliant Rose
Cardinal Red A, R
Soap Red BL
Soap Brown M, S
New Soap Brown
Mode Brown
Dark Brown
Heliotrope 1225J
Heliotrope R
Light Blue Ia
Fine Blue B
Brilliant Soap Blue
Brilliant Blue extra
Plum Blue
Dark Blue
Fast Light Green
Fine Soap Green
Soap Green 3312J
Soap Green 3287J.

DYESTUFFS FOR WAX, CANDLES,

For dyeing these materials, our Cerasine Colours as well particularly well adapted. The dyestuffs are added to the also by heating. Below is a list of those of our dyestuffs of their relative

(Green is obtained by mixing 2 parts of

Solubility in *	Cerasine Rose I	Cerasine Red I	Cerasine Red II	Cerasine Red A	Cerasine Red B	Cerasine Dark Red I	Cerasine Dark Red II	Cerasine Orange G	Cerasine Brown and Cerasine Orange I
Alcohol at 160–175° F	10:100	1:100	10:100	0.1:100	0.1:100	0.2:100	0.2:100	0.4:100	0.5:100
Spirit varnish at 160–175° F	15:100	1:100	15:100	0.1:100	0.1:100	0.2:100	0.2:100	1:100	1:100
Copal varnish at 160–175° F	2:100	1.5:100	2:100	1:100	0.8:100	2:100	2:100	1.5:100	2:100
Turpentine Oil at 160–175° F	0.5:100	2.5:100	0.5:100	1:100	0.8:100	2:100	2:100	1.5:100	2:100
Linseed Oil at 160–175° F	2:100	1.5:100	2:100	1.5:100	1:100	1.5:100	1.5:100	1:100	3:100
Petroleum Benzine at 105° F	0.2:100	4:100	0.2:100	0.15:100	0.1:100	0.3:100	0.3:100	0.2:100	0.3:100
Coaltar Benzene at 160° F	2:100	5:100	2:100	1.6:100	2:100	3:100	3:100	1.5:100	1.5:100
Wax at 160° F	2:100	7.5:100	2:100	2:100	1.5:100	5:100	2:100	2:100	2.5:100
Stearine at 160° F	3:100	7.5:100	3:100	5:100	4:100	5:100	2:100	4:100	5:100
Paraffine at 160° F	1:100	7.5:100	1:100	1.5:100	1.5:100	5:100	2:100	2:100	2:100
Resistance to Light	mode-rate	good	mode-rate	good	good	good	good	very good	very good
Resistance to Heat at 250° F	bad	good	bad	good	good	good	good	very good	good

* For instance: 10 lbs Cerasine Rose I

** The products provided with two asterisks (**) must first be melted

as Indazine soluble in spirits and Black soluble in oil are mass to be dyed, and dissolved by stirring, in some cases best suited for the purpose, together with a tabulation solubility and fastness.

Cerasine Blue I with 1 part Cerasine Yellow I.)

Cerasine Brown NA	Cerasine Yellow AT	Cerasine Yellow ATG	Cerasine Yellow I	Cerasine Violet I	Cerasine Blue I	Indazine soluble in spirits	Induline Base 140, 714Z 3586Z**	Nerazine Base B, BG**	Black soluble in oil III
0.2:100	15:100	1.2:100	10:100	10:100	12:100	3:100	4:100	4:100	10:100
0.2:100	20:100	1.2:100	15:100	15:100	15:100	4:100	5:100	5:100	10:100
0.75:100	12:100	2.5:100	2:100	2:100	2:100	0.5:100	6:100	6:100	15:100
0.75:100	12:100	3.5:100	0.5:100	0.5:100	0.5:100	0.4:100	6:100	6:100	20:100
0.2:100	5:100	2:100	2:100	2:100	2:100	0.5:100	5:100	5:100	20:100
0.5:100	1.5:100	4:100	0.2:100	0.5:100	1:100 reddish brown	insoluble	5:100	5:100	4:100
1:100	20:100	15:100	2.5:100	2.5:100	2.5:100 reddish brown	0.3:100	6:100	7:100	5:100
0.5:100	10:100	20:100	2:100	2:100	2:100	0.5:100	4:100	5:100	5:100
0.5:100	10:100	20:100	4:100	4:100	2:100	1:100	50:100	50:100	10:100
0.5:100	8:100	1:100	1:100	1:100	1:100	0.4:100	0.5:100	0.6:100	5:100
good	very good	good	moderate	moderate	moderate	good	good	good	good
good	good	good	bad	bad	bad	good	good	good	good

are soluble in 100 lbs alcohol.

with double their weight of oleïne or stearine at 100° C. (212° F.).

LEATHER FINISHES.

Leather finishes are applied in order to impart to the leather during the finishing process special properties respecting appearance, touch, resistance to moisture, rubbing off etc., or again to preserve the original properties of the leather in made-up leather goods (trunks, portmanteaux, shoes, etc.).

In the following will be found a list of the finishes principally used for leather, together with particulars of their ingredients and of the dyestuffs used in connection therewith, as well as the methods of producing and applying them.

I. FINISHES FOR LEATHER MANUFACTURE.

1. Glaze Finishes

(Glaze, High Polish, Lustre, Finish, Season).

In most cases these are tinted, only lightly so for fancy-coloured leather, but for black leather to such a degree as to ensure a sufficiently deep shade. The following dyestuffs come into consideration for the purpose:

For Yellow:

Indian Yellow G or R
Fast Yellow S.

For Red:

Brilliant Croceïne BOO
Roccelline.

For Havana etc.:

Havana Brown S conc.

For Reddish Brown:

Acid Brown D

For Blue:

Naphtol Blue R

For Green:

Acid Green extra conc.

For Black:

Nigrosine soluble in water
Nigrosine OHH
Nigrosine OJFB
Nerazine G, BR.

These finishes are prepared in the following manner:

Albumen (egg albumen for pale, blood albumen for dark shades) is allowed to soak for several hours in cold or lukewarm water with the addition of just a little ammonia. Blood, which should only be used for blacks, is defibrated previously and then diluted with water to which some ammonia is added. To this solution add for pale shades a little barbery juice, for blacks a logwood decoction previously mixed with ammonia until the change in colour has just set in, finally adding the requisite quantity of dyestuff dissolved in water. A small addition of gelatine dissolved in water considerably enhances the glaze. For preserving, formaline is used, but this should not be added if the leather to be glazed has been dyed with Magenta, Russian Red, Cerise or Ox-Blood. In this case carbolic acid or mustard oil are used as preserving agents, their smell being neutralised with oil of mirbane, lavender oil, etc.

If only a moderate glaze is to be produced, decoctions of linseed, flea-wort seed, tragacanth, Irish moss, etc. or diluted milk may be used for the same purpose, the respective decoction being tinted with the afore-mentioned dyestuffs.

These solutions are brushed on to the leather, which is then polished on the machine.

2. Protective Finishes.

These kinds of finishes come into consideration along with those described above if the glazed leather is to be protected against outside influences, for instance, upholstery leather against rubbing off, leather for saddles particularly also against rubbing off in a wet state. For this purpose the leather is given a coating with one of the solutions indicated below, care being taken that the solution is sufficiently thick to produce the desired effect, but not so thick as to be visible as a coating of varnish. The solution has to be diluted accordingly. The solutions must be just sufficiently tinted with the dyestuffs mentioned to prevent the leather from presenting a whitish appearance.

a) *Shellac Solution in Alcohol.* This solution is produced by heating the shellac with the requisite amount of alcohol (96%) in the water bath. One-fourth of the alcohol may also be replaced by the same quantity of turpentine oil. The requisite dyestuff dissolved in alcohol is added straightaway, the following products being well adapted for the purpose:

For Yellow:

Thioflavine T, TCN
Naphtaline Yellow Crystals
Cerasine Yellow AT.

For Orange:

Cerasine Orange I.

For Red:

Safranine S No 150
Russian Red G, B.

For Brown:

Bismarck Brown GG 125%
Cerasine Brown.

For Blue:

Spirit Blue B, R.

For Green:

Solid Green Crystals O
Brilliant Green Crystals extra.

For Black:

Brilliant Black N, NE, RE
Lake Black C.

b) *Shellac Solution in Borax or Ammonia.* Shellac, water and borax or ammonia are heated together until complete solution of the shellac has been brought about, 2½ oz borax or 1½—2 oz ammonia being required for 10 oz shellac.

This solution is tinted with the dyestuffs mentioned under (1), dissolved in water.

c) *Caseïne in Borax or Ammonia.* Stir the caseïne up with a little water to a thin paste, adding of borax or ammonia one-tenth of the quantity of caseïne. Varying with the progress of swelling, water is added to the paste to prevent it from becoming too thick.

The tinting is done with the dyestuffs mentioned sub (1), dissolved in water.

d) *Collodion Varnish* is a solution of nitrocellulose in amyl acetate. It is tinted with the dyestuffs indicated on pages 200 and 201, which are dissolved in the collodion varnish by shaking.

Castor oil may likewise be added in order to impart more elasticity to the varnish; in such case the dyestuff is dissolved in castor oil.

e) *Collodion* is a solution of nitrocellulose in a mixture of alcohol and ether, for tinting which the dyestuffs mentioned under (2a), dissolved in alcohol, are used. Collodion may likewise be used in combination with collodion varnish.

II. FINISHES FOR LEATHER GOODS, BOOTS AND SHOES.

1. Leather Creams

are used for keeping boots and shoes in good condition and for shining them. There are two kinds of finishes, viz., soap creams and turpentine oil creams.

a) *Soap cream* is an emulsion of wax in soap solution, to which some paraffine, stearic acid or similar substances may be added.

It is prepared as follows: Wax (carnauba wax, Japanese wax, Montan wax or other kinds of wax or paraffine imparting a gloss and being of a non-sticky nature) are melted down; then a solution of some Cerasine Colour in melted stearic acid is added to give the combination melt a moderate colouring. Instead of stearic acid, rosin (colophony) may equally well be used. While continuously stirring, pour into the hot mass a solution of as much soda ash as has been used of stearic acid, then the dyestuff dissolved in water and mixed with the requisite amount of soap solution. The heating and stirring is continued until a perfectly even, thin paste results. It is an advantage to add a slight amount of turpentine oil.

The following dyestuffs are suitable for dyeing wax:

For Yellow:

Cerasine Yellow AT
Cerasine Orange I.

For Brown:

Cerasine Brown.

For Red:

Cerasine Red B.

For Black:

Black soluble in oil III
Induline Base 714Z
Induline Base 2455J.

For colouring the soap solution, the following dyestuffs are recommended as being particularly fast to alkalies and possessing sufficiently good fastness to light:

For Yellow:

Leather Cream Yellow.

For Brown:

Leather Cream Brown
Diamine Fast Brown G, R.

For Red:

Amaranth.

For Black:

Nigrosine soluble in water
Nerazine G, GA, BR.

b) *Turpentine oil cream* is a solution of the various kinds of wax and paraffine mentioned under (a) in turpentine oil, yielding a creamy paste when cold.

Turpentine oil cream is produced by melting the wax with the respective dyestuffs, sufficient turpentine oil being added to the mass to give it the right consistency when cold. The stirring must be continued until the liquid thickens.

The dyestuffs suited for this purpose are the same as recommended for tinting the wax for soap cream, the only difference being that for turpentine oil cream considerably more dyestuff is required to produce the right depth.

2. Upper Leather Finishes for Boots and Shoes and Protective Finishes for Leather Goods and Upholstery Leather.

These are identical with the solutions mentioned on pages 204 to 206 as protective finishes; regarding the colouring see the same particulars.

3. Finish for Book Binders and Trunk Makers.

The above remarks apply equally here.

4. Cold Polish Ink and Bottom Stains

are solutions of various adhesive substances (tragacanth, carragheen moss, starch) in water, or solutions of shellac in a borax solution. For yellow, brown and red shades, only earth colours and colour lakes are applied for this purpose which are suspended in the solution.

For Black,

Nigrosine soluble in water
Nigrosine OJFB
Nerazine G, BR

are used. The dyestuff is dissolved in only a small quantity of water and added to the tragacanth etc. solution while still warm.

APPENDIX:

Water and the Ordinary Chemicals.
Thermometer and Hydrometer Tables.
Weights and Measures.
Alphabetical Index.
Percentage Tables.

WATER AND THE ORDINARY CHEMICALS.

Water.

Water is one of the most important requirements in dyeing, and the results obtained are often entirely dependent on the condition and quality of the water used. It is most important therefore to see that the water used for dyeing is of good quality. The purer it is, that is to say, the less foreign matter it contains, the better it is adapted for dyeing purposes and the more completely the dyestuffs and other ingredients of the bath are utilised.

A very pure quality of water is condensed water, which in most dyeworks can be collected free from oil, and is excellently adapted for dyeing purposes, chiefly for dissolving the dyestuffs and charging the dyeing machines. Rain water may likewise be used to good advantage, and can easily be collected free from mechanical impurities. Water from ponds, provided it is free from mud, is very serviceable. Other waters, in the natural state, always contain more or less impurities dissolved, and frequently also mechanical impurities.

The impurities which are the most troublesome to the dyer are the sulphates and bicarbonates of lime and magnesia, sometimes also magnesium chloride, which, together with the iron compounds, cause the hardness of the water; the iron compounds are most obnoxious in bleaching. The impurities dissolved in the water have a deleterious effect in so far as they often precipitate a portion of the dyestuffs, soaps, oils and mordants, and are thus

apt to cause spots and other irregularities, not to mention the loss of dyestuff, soap, etc.

Iron, apart from its property to form brown precipitates, has the disadvantage of dulling the shades. This may also be said of mud, which soils the goods mechanically.

Water free from lime, magnesium or iron salts, or which contains slight quantities of these only, for instance condense water or rain water, is called soft water in contradistinction to hard water. The hardness of the water is expressed in degrees, and varies in the different countries.

1 English degree of hardness is equivalent to 1 part of calcium carbonate in 70 000 parts of water

or 1 grain of calcium carbonate ($CaCO_3$) per gallon of water;

1 German degree of hardness is equivalent to 1 part of calcium oxide (Ca O) in 100 000 parts of water;

1 French degree of hardness is equivalent to 1 part of calcium carbonate ($CaCO_3$) in 100 000 parts of water.

1° English corresponds therefore to 0.8° German or 1.43° French.

Hard water on boiling loses its hardness by separating the bicarbonates in the form of carbonates. This hardness is usually called *temporary hardness*, whereas the hardness not removed by boiling is called *permanent hardness;* the sum of the two is called the *total hardness.*

Whether the water is to be considered good or bad is dependent upon the use to which it is put, but at any rate no water should be used for dyeing which exceeds 23—25° (Engl.) in hardness. Water harder than this is unsuitable particularly for dyeing in mechanical apparatus or for soaping or oiling.

If hard water only be available, it is well to soften it. For large daily consumption this is best done by means of one of the water-purifiers con-

structed by the different machine-works in which the water is softened and purified by a constant inflow of lime and soda.

Of late, too, water is corrected by the Permutite process, which has been adapted by numerous Garment dyers.

If so desired we shall be pleased to give particulars for correcting the water in any special case.

At small etablishments the purification may be done in large wooden vessels. For every degree of permanent hardness, about 2½ oz soda ash are added to 1000 gallons of the water to be corrected; thus, with for instance a permanent hardness of 20°, about 3 lbs soda ash should be added for 1000 gallons. After boiling up well, the water is left standing for a few hours in order to allow the precipitate to settle, whereupon the clear water freed from the precipitate is used. It is best to work with two vats, the size of which depends upon the daily requirement; the precipitate of the boiled water thus may be allowed to settle in the one vat while the soft water in the other is being used.

Any excess of soda present in the water should be neutralised by acidifying slightly with acetic or sulphuric acid until blue litmus paper just begins to be reddened. The amount of soda necessary for correction is dependent on the permanent hardness of the water. It is best to use only just enough soda to cause the slightest possible alkaline reaction after the water has been purified, i. e. the water should not cause red litmus paper to become strongly blue and should require but a very small amount of acetic or sulphuric acid for turning blue litmus paper red.

Water containing solid substances should best flow — before softening — through a pool or pond in which the greater portion of the mud collects at the bottom, the remainder settling along with the lime precipitate when the softening takes place.

Sulphuric Acid.

Sulphuric acid is a thick, oily liquid without any colour (rendered brownish sometimes through the presence of small amounts of organic substances).

For dyeing, the ordinary commercial sulphuric acid, so-called oil of vitriol or D. O. V. is commonly used, which should contain 93—98% pure sulphuric acid and have a specific gravity of approximately 168° Tw.

Fuming sulphuric acid contains sulphuric acid anhydride, and is no longer used in dyehouses.

Sulphuric acid absorbs water from the air with great avidity, and should therefore be kept in closed vessels. On mixing with water it evolves great heat. In order to avoid dangerous boiling up and spattering, sulphuric acid should always be diluted by being poured in a thin jet into a large quantity of cold water, stirring well all the time; the water should not be hot, nor should water ever be added to undiluted acid. Sulphuric acid diluted with one-half its weight of water does not become heated again severely by the addition of cold water.

Sulphuric acid is used to the widest extent in wool and silk dyeing, particularly in the dyeing of Acid Colours and Chrome Colours. In cotton dyeing sulphuric acid is likewise used sometimes, e. g. for diazotising and for souring off.

In wool dyeing it is frequently used in the form of bisulphate of soda, 1 part of sulphuric acid corresponding to 2½ parts of bisulphate of soda. Somewhat larger quantities of Glauber's salt have to be added when dyeing with sulphuric acid than with bisulphate of soda, because the latter, which is to be regarded as a combination of sulphuric acid and

Glauber's salt, generates Glauber's salt during the dyeing.

The strength of sulphuric acid may be determined with the hydrometer according to the following table:

Specific gravity at 15° C. (59° F.)
(Lunge and Isler).

Degrees Twaddle	Per cent sulphuric acid	Degrees Twaddle	Per cent sulphuric acid	Degrees Twaddle	Per cent sulphuric acid	Degrees Twaddle	Per cent sulphuric acid
2	1.57	48	32.28	94	56.90	140	77.17
4	3.03	50	33.43	96	57,83	142	78.04
6	4.49	52	34.57	98	58.74	144	78.92
8	5.96	54	35.71	100	59.70	146	79.80
10	7.37	56	36.87	102	60.65	148	80.68
12	8.77	58	38.03	104	61.59	150	81.56
14	10.19	60	39.19	106	62.53	152	82.44
16	11.60	62	40.35	108	63.43	154	83.32
18	12.99	64	41.50	110	64.26	156	84.50
20	14.35	66	42.66	112	65.08	158	85.70
22	15.71	68	43.74	114	65.90	160	86.90
24	17.01	70	44.82	116	66.71	162	88.30
26	18.31	72	45.88	118	67.59	164	90.05
28	19.61	74	46.94	120	68.51	165	91.00
30	20.91	76	48.00	122	69.43	166	92.10
32	22.19	78	49.06	124	70.32	167	93.43
34	23.47	80	50.11	126	71.16	168	95.60
36	24.76	82	51.15	128	71.99	168.3*	97.70
38	26.04	84	52.15	130	72.82	168.1*	98.70
40	27.32	86	53.11	132	73.64	168*	99.20
42	28.58	88	54.07	134	74.51	167.7*	99.95
44	29.84	90	55.03	136	75.42		
46	31.11	92	55.97	138	76.30		

* Sulphuric acid of 97.70% has the highest specific gravity, whilst that of stronger acid is a little lower.

Hydrochloric Acid.

Hydrochloric or muriatic acid appears in commerce as a liquid either colourless or coloured greenish yellow by traces of iron. The commercial acid usually has a specific gravity of 26—38° Tw., and is contaminated with iron, arsenic, sulphuric acid and organic substances; for dyeing it is usually sufficiently pure. For the production of Paranitraniline Red pure hydrochloric acid of 35—36° Tw. should be used.

Hydrochloric acid forms a freely soluble lime salt viz. calcium chloride, and is therefore to be preferred to sulphuric acid for removing lime salts by souring off.

In dyeing, hydrochloric acid is used for various purposes, e. g. for preparing the diazotising baths and for souring off.

The strength of hydrochloric acid may be determined by twaddling according to the following table.

Specific gravity at 15° C. (59° F.)
(Lunge and Marchlewski).

Degrees Twaddle	Per cent hydrochloric acid	Degrees Twaddle	Per cent hydrochloric acid	Degrees Twaddle	Per cent hydrochloric acid	Degrees Twaddle	Per cent hydrochloric acid
1	1.15	11	11.18	21	20.97	31	30.55
2	2.14	12	12.19	22	21.92	32	31.52
3	3.12	13	13.19	23	22.86	33	32.49
4	4.13	14	14.17	24	23.82	34	33.46
5	5.15	15	15.16	25	24.78	35	34.42
6	6.15	16	16.15	26	25.75	36	35.39
7	7.15	17	17.13	27	26.70	37	36.31
8	8.16	18	18.11	28	27.66	38	37.23
9	9.16	19	19.06	29	28.61	39	38.16
10	10.17	20	20.01	30	29.57	40	39.11

It will be noticed that each degree Twaddle indicates approximately 1 percent pure hydrochloric acid.

Acetic Acid.

Acetic acid is obtained by the dry distillation of wood. The pure concentrated product solidifies at ordinary temperature forming crystals of ice-like appearance, and is therefore called *glacial acetic acid.* Owing to its high price, it is not used for dyeing purposes.

Commercial acetic acid is a colourless liquid usually containing 30—50% pure acetic acid. Besides water it generally contains from its preparation

empyreumatic substances and traces of mineral acids; it is moreover sometimes adulterated with mineral acids. An admixture of the latter is liable to be especially injurious in acetic acid used for brightening or scrooping cotton goods, as the mineral acids are apt to tender the cotton on storing. For such purposes, only acetic acid warranted free from mineral acids should be used, whilst for most other purposes a slight admixture of mineral acids is of no consequence.

Acetic acid is used in dyeing for acidifying the liquors for dyeing, mordanting and aftertreating, particularly also when dyeing in feebly acid baths, in order to cause the colouring matters to dye more slowly and evenly, especially when the sulphuric acid would act too rapidly and severely. Acetic acid is also used largely for brightening silk. More recently, formic acid is frequently used as a cheap substitute for acetic acid.

The hydrometer, while insufficient for determining the exact strength of acetic acid, is used for estimating its concentration approximately.

Specific gravity of acetic at 15° C. (59° F.) (Oudemans).

Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle	Per cent acetic acid	Degrees Twaddle
5	1.3	25	7.0	45	11.4	65	14.3	85	14.8
10	2.8	30	8.2	50	12.3	70	14.7	90	14.3
15	4.3	35	9.4	55	13.1	75	14.9	95	13.2
20	5.7	40	10.5	60	13.7	80	15.0	100	11.1

The specific gravities above 11° Tw. correspond to two liquids of different strengths. To ascertain whether the acid contains more or less than 77% pure acetic acid, a *small* quantity of water should be added after measuring; if, on again measuring, a higher specific gravity is found, the acid contains more than 77%, otherwise less.

Formic Acid.

Pure formic acid is a colourless liquid with a boiling point of 100.8° C. (213½° F.), which freezes to a crystalline mass melting at 8.6° C. (47½° F.). Its specific gravity at 15° C. (59° F.) is 1.256.

Formic acid as a rule is sold in a high degree of purity, chiefly in strengths of 85% and 98—100% pure acid.

When dyeing with Acid Colours, Chrome Colours etc., formic acid behaves very similarly to acetic acid, but is more than twice as efficacious as the latter with the same percentages. (Formic acid of 85%, as usually sold, may be considered as being about five times as efficacious as the 30% acetic acid.) Formic acid also resembles acetic acid in that is does not impair the vegetable fibre.

Formic acid, if its higher price does not stand in the way, serves as a very good substitute for sulphuric acid, particularly in union dyeing, equal parts of concentrated formic and sulphuric acid nearly corresponding with each other.

Formic acid is also used very largely as a substitute for tartar in mordanting with chrome.

In silk dyeing, formic acid is used as a substitute for acetic acid both for dyeing and brightening.

Specific gravity of formic acid at 20° C. (68° F.) (Richardson and *Allaire).*

Perc. by Weight Formic acid	Perc. by Volume Formic acid	Specific Gravity	Perc. by Weight Formic acid	Perc. by Volume Formic acid	Specific Gravity	Perc. by Weight Formic acid	Perc. by Volume Formic acid	Specific Gravity
5	4.14	1.0116	40	35.90	1.0964	75	72.27	1.1770
10	8.40	1.0247	45	40.82	1.1086	80	77.67	1.1861
15	12.80	1.0371	50	45.88	1.1208	85	83.19	1.1954
20	17.17	1.0489	55	51.01	1.1321	90	88.74	1.2045
25	21.23	1.0610	60	56.13	1.1425	95	94.48	1.2141
30	26.37	1.0730	65	61.44	1.1544	100	100	1.2213
35	31.10	1.0848	70	66.80	1.1656			

Lactic Acid.

Commercial lactic acid represents a pure yellow to brown syrup containing 50, and sometimes 80 percent of pure lactic acid, contaminated by sulphuric acid, sugar, dextrine, iron and other substances. In water, lactic acid is soluble in any proportion.

On account of its stronger reducing properties, lactic acid is frequently used as a substitute for tartar and for oxalic acid when dyeing on a chrome mordant, for which purpose the acid salts of lactic acid, known as lactoline, are also used.

In silk dyeing, lactic acid is used as a brightening agent.

Oxalic Acid.

Oxalic acid forms colourless crystals which at ordinary temperature dissolve in about eight times their weight of water, and at a higher temperature dissolve exceedingly readily in water. Oxalic acid and its salts are poisonous.

Commercial oxalic acid is chemically almost entirely pure. Oxalic acid is a strong acid, and behaves in dyeing on the whole similarly to sulphuric acid, on which account it is used largely for fixing Acid Colours, particularly in wool printing. It further possesses good reducing properties, and is therefore frequently employed as a substitute for tartar when mordanting with chrome.

Owing to its property to form a lime salt completely insoluble in water and acetic acid, it is applied also in some other cases, for instance in the dyeing of Naphtyl Blue Black with the addition of copper sulphate; in this case it cannot be substituted by sulphuric acid, as the latter prevents the copper from going on to the fibre.

Tartaric Acid.

Tartaric acid is marketed in the shape of large colourless crystals which are very readily soluble in water, but less easily in alcohol. 100 parts water dissolve 115 parts tartaric acid at 0° C. (32° F.) and 140 parts at 20° C. (68° F.). It is used largely for fixing Acid Colours in wool printing, and for brightening silk dyeings.

Oleic Acid or Oleïne.

Crude oleic acid or so-called *oleïne* is a by-product obtained in the manufacture of stearic acid, and forms an oil of a melting point of 14° C. (57° F.) insoluble in water. Its alkaline salts are readily soluble in water, while its other salts are insoluble.

Oleïne is used in considerable quantities for greasing wool and in the preparation of soap, as well as in the washing and milling of wool, and for other dyeing purposes. For the production of a neutral soap, about 48 parts of good potash or 38 parts of soda ash are required for 100 parts oleïne.

Stearic Acid (Stearine)

is a white mass melting at 69° C. (157° F.), insoluble in water, difficult to dissolve in alcohol and easily soluble in ether and in alkalies. It is used for rendering certain colour bases, particularly Nerazine Base, soluble in oil and in benzine.

Caustic Soda, Sodium Hydroxide or Sodium Hydrate; Caustic Soda Lye.

Caustic soda, known scientifically as "sodium hydroxide", is marketed as a white molten mass in iron drums. It very readily dissolves in water and is deliquescent in the air, the resulting solution by

absorbing carbon dioxide soon forming a hard mass of sodium carbonate. It has a very strong caustic effect and taste.

The usual market qualities contain 77—97% pure sodium hydroxide.

Caustic soda lye is the aqueous solution of caustic soda, and as the dissolving of caustic soda is very inconvenient, it is bought for preference ready made where conditions of freight and transport are favourable.

Caustic soda lye, like sodium hydroxide, has a very strong caustic action. It should be particularly borne in mind that the smallest drop of even very dilute caustic soda lye is of grave danger to the eye.

Specific gravity of caustic soda lye at 15° C. (59° F.) (Lunge).

Per cent Sodium Hydroxide	Degrees Twaddle	Per cent Sodium Hydroxide	Degrees Twaddle	Per cent Sodium Hydroxide	Degrees Twaddle
1	2.4	21	47.2	41	89.4
2	4.6	22	49.4	42	91.5
3	7.0	23	51.6	43	93.6
4	9.2	24	53.8	44	95.6
5	11.8	25	55.8	45	97.6
6	14.0	26	58.0	46	99.8
7	16.2	27	60.0	47	101.6
8	18.4	28	62.0	48	103.8
9	20.6	29	64.2	49	105.8
10	23.0	30	66.4	50	108.0
11	25.2	31	68.6	51	110.0
12	27.4	32	70.2	52	112.0
13	29.6	33	72.6	53	114.0
14	31.8	34	74.8	54	116.0
15	34.0	35	76.8	55	118.2
16	36.2	36	79.0	56	120.2
17	38.4	37	81.0	57	122.2
18	40.4	38	83.0	58	124.4
19	42.6	39	85.2	59	126.6
20	45.0	40	87.4	60	128.6

Sodium hydroxide and caustic soda lye are used in the bleaching of cotton and in the dyeing of a good many colours, for instance, of Hydron Colours, and in the dissolving of certain developers. They are very important also for the mercerising of cotton and the preparation of soap.

The strength of caustic soda lye is determined by means of the hydrometer at hand of the table given on the previous page. It has to be observed that the hydrometer does not indicate whether the product contains soda, common salt or Glauber's salt, nor the quantities of these products present. Such impurities will raise the specific gravity of the lye.

Ammonia (Liquor Ammoniae).

Ammonia represents the aqueous solution of ammonia gas and has a very pungent smell. It is marketed mostly in a strength of 24% (0.913 specific gravity), and is thus lighter than water.

Ammonia gas is driven out of the solution by heat, and escapes into the air. The gas is sold in a condensed form in steel cylinders as a chemically almost pure liquid.

Ammonia has a strongly alkaline effect, and blues red litmus paper; it neutralises all acids and forms salts therewith. Its effect is milder than that of caustic soda lye, and it offers the great advantage that any excess easily volatilises, and consequently in many cases has no deleterious effect.

Ammonia is used in wool scouring, for neutralising acids and for other purposes.

Its strength is usually determined by twaddling in accordance with the following table.

Specific gravity of ammonia at 15° C. (59 deg. F.) (Lunge and Wiernik).

Specific gravity at 59° F.	Per cent (gaseous) ammonia	Specific gravity at 59° F.	Per cent (gaseous) ammonia	Specific gravity at 59° F.	Per cent (gaseous) ammonia
1.000	0.00	0.960	9.91	0.920	21.75
0.995	1.15	0.955	11.34	0.915	23.36
0.990	2.31	0.950	12.74	0.910	24.99
0.985	3.55	0.945	14.22	0.905	26.65
0.980	4.80	0.940	15.63	0.900	28.33
0.975	6.05	0.935	17.12	0.895	30.03
0.970	7.31	0.930	18.64	0.890	31.75
0.965	8.59	0.925	20.18	0.885	33.68

Sodium Sulphide.

Sodium sulphide is marketed in two qualities, viz, as crystallised and as concentrated sodium sulphide. Crystallised sodium sulphide consists of brownish crystals containing 32½% pure sodium sulphide and in addition water of crystallisation. The concentrated product has usually double the strength, and is sold in the form of grey or greyish black, irregular lumps.

Sodium sulphide dissolves readily in cold or warm water. It absorbs moisture, carbon dioxide and oxygen from the air, liquefies, and becomes partially converted into carbonate and sulphate of soda. As it thereby loses correspondingly in strength, it should be stored if possible in well closed receptacles and should not be kept too long in stock.

Sodium sulphide is used for dissolving Sulphide Colours, and is applied as described in the foregoing chapters.

Soda or Soda Ash, Sodium Carbonate or Carbonate of Soda.

Soda is usually sold as a white powder (soda ash, Solvay or ammonia soda) or in the form of crystals (soda crystals, crystal carbonate). It is

produced principally according to the older Leblanc process or the more recent Solvay or ammonia process, and nowadays also by electrolysis. Before the introduction of the Solvay process, Leblanc soda was often very impure, whereas Solvay soda apart from common salt cannot contain any soluble impurities over from the manufacture. Ammonia soda is therefore frequently preferred, but Leblanc soda has likewise been manufactured in excellent purity for a number of years already.

Soda crystals is crystallised soda containing about 63% crystal water and small amounts of Glauber's salt, but no deleterious impurities. It contains mostly about 36% pure sodium carbonate. Since soda ash of good quality is obtainable, soda crystals is not used much nowadays in dyehouses, as it is too expensive comparatively; the only advantages it possesses over good soda ash is that its strength is nearly always the same and that it dissolves quickly in water without forming lumps.

Crystal carbonate is likewise a pure crystallised soda, containing however only 18% water of crystallisation.

Soda is stable on exposure to the air. Soda ash, however is apt to form hard lumps in moist air, without absorbing any appreciable quantities of water. Soda has a caustic taste, but a milder alkaline effect than caustic soda. It is neutralised by most acids like sulphuric, hydrochloric and acetic acid with development of carbon dioxide, its solutions therefore effervescing on acids being added.

Soda dissolves most copiously in water of 32,5° C. (90½° F.).

100 parts of water dissolve the following quantities of pure sodium carbonate at:

32	41	50	59	68	86	90½	93 and 174	212° F.	
7.1	9.5	12.6	16.5	21.4	38.1	59	46.2	45.1	parts soda.

Soda ash is marketed in various degrees of strength, calculated on the supposed percentages of sodium oxide. Good qualities of soda ash contain

81%, 88—95% and 98% sodium carbonate. Solvay or ammonia soda usually contains 98—99% sodium carbonate, and is sufficiently pure for all dyeing purposes.

Our indications regarding *soda ash* refer to the good qualities (95—98%), of whatever manufacture they may be. 100 parts of good soda ash are approximately equivalent to 270 parts soda crystals.

The strength of pure soda solutions may be determined with the hydrometer at hand of the following table. It has however to be observed that impurities like salt, Glauber's salt and sodium sulphide are not especially indicated.

In the dyeing industry, soda is used particularly for scouring and wetting out, in the dyeing of Diamine Colours, Immedial Colours, Alkaline Blues, etc., for neutralising acids, preparing soaps, and other purposes.

Specific gravity of soda solution 15° C. (59° F.) (Lunge).

Degrees Twaddle	Per cent Sodium Carbonate	Degrees Twaddle	Per cent Sodium Carbonate	Degrees Twaddle	Per cent Sodium Carbonate
1	0.47	11	5.23	21	9.90
2	0.95	12	5.71	22	10.37
3	1.42	13	6.17	23	10.83
4	1.90	14	6.64	24	11.30
5	2.38	15	7.10	25	11.76
6	2.85	16	7.57	26	12.23
7	3.33	17	8.04	27	12.70
8	3.80	18	8.51	28	13.16
9	4.28	19	8.97	29	13.63
10	4.76	20	9.43	30	14.09

Common Salt, Sodium Chloride (Rock Salt).

Common salt is made from rock-salt, brine, sea-water etc. It crystallises without water of crystallisation, but ordinarily contains some mois-

ture, and frequently also some sodium sulphate, calcium sulphate or magnesium chloride. The solubility of common salt is about the same at any temperature, and varies only between 35.5 parts common salt at 0° C. (32° F.) up to 39.2 parts at 100° C. (212° F.), in 100 parts of water. The specific gravity of aqueous solutions at 15° C. (59° F.) according to Gerlach is as follows:

Per cent common salt	5	10	15	20	25	26.4	saturated.
Specific gravity	1.0362	1.0733	1.1114	1.1510	1.1923	1.2043	
Degrees Twaddle	7.2	14.7	22.3	30.2	38.5	40,9	

Glauber's Salt, Sodium Sulphate or Sulphate of Soda.

Glauber's salt is used as Glauber's salt crystals or as desiccated Glauber's salt (sodium sulphate). The desiccated product may contain various impurities, especially an excess of sulphuric acid. The crystallised salt is generally of a fairly pure quality, and, if chemically pure, contains 44.1% anhydrous salt and 55.9% water. It effloresces in the air and is easily soluble in water. 100 parts desiccated Glauber's salt are equivalent to about 220 parts Glauber's salt crystals.

100 parts of water dissolve at

32°	50°	59°	68°	77°	86°	91½°	104°	217½° F.	
5	9	13	19	28	40	50	49	42.6	parts of desiccated Glauber's salt.

For cotton, Glauber's salt is used in the dyeing of Diamine and Immedial Colours.

In machine-dyeing, special care must be taken that the Glauber's salt used is readily soluble, on which account Glauber's salt crystals should be here given the preference.

Glauber's salt is further used in the dyeing of wool, half-wool and half-silk, but not so much for silk dyeing, and is generally applied in the form of crystals. It is chiefly used for the dyeing of Acid Colours and Chrome Colours in order to retard the

absorption of the dyestuff by the fibre and thus facilitate the production of good level shades.

A slight excess of acid contained in the Glauber's salt does not affect the dyeing of the Acid or Chrome Colours, but may cause a too rapid absorption of Diamine Colours by the wool, particularly in the dyeing of unions; the Glauber's salt used for this purpose should therefore be neutral, i. e. not redden blue litmus paper.

Specific gravity of aqueous solutions of desiccated Glauber's salt at 15° C. (59° F.).

Per cent desicc. Glauber's salt	Specific Gravity	Per cent desicc. Glauber's salt	Specific Gravity	Per cent desicc. Glauber's salt	Specific Gravity
1	1.0091	5	1.0457	9	1.0832
2	1.0182	6	1.0550	10	1.0927
3	1.0274	7	1.0644	11	1.1025
4	1.0365	8	1.0737	12	1.1117 saturated.

The percentages of crystallised Glauber's salt are found by multiplying the above percentages by 2¼.

Sodium Bisulphate or Bisulphate of Soda.

A white, crystalline mass very freely soluble in water. In a dilute aqueous solution this salt gradually dissociates into neutral sodium sulphate (Glauber's salt) and free sulphuric acid, and for this reason is used in wool dyeing instead of a mixture of sulphuric acid and Glauber's salt as a slowly acting agent for gradually acidulating the dye liquor.

10 parts of sodium bisulphate are practically equivalent to a mixture of about 4 parts sulphuric acid and 10 parts Glauber's salt crystals.

Bisulphate frequently containing iron as an impurity, sulphuric acid and Glauber's salt are as a rule given the preference when dyeing bright scarlet shades. For other purposes the technical bisulphate will in most cases be found sufficiently pure.

Sodium Nitrite or Nitrite of Soda. Nitrite.

Sodium nitrite forms small crystals freely soluble, but not deliquescent in the air, and containing 95—98% nitrite.

It is used for diazotising dyestuffs to be developed, its action being based on the liberation of nitrous acid by the addition of mineral acids, such as hydrochloric or sulphuric acid; acetic acid has not the same effect. For 1 part of nitrite, 3 parts of hydrochloric acid 32° Tw. or 2 parts of sulphuric acid are used.

Sodium Acetate or Acetate of Soda.

This salt forms clear, very readily soluble crystals which decompose but very little. It serves for neutralising free mineral acids, forming their salts and liberating free acetic acid. It is used for instance in the coupling and also in the developing of Paranitraniline Red, i. e. in the preparation of the solution of the diazotised Paranitraniline or of Nitrazol. For union goods which have been cross-dyed in an acid bath, a final impregnation with acetate of soda is very useful for preserving the strength of the cotton fibre, and an addition of acetate of soda to the last bath used for rinsing union goods dyed with Immedial Black is always advisable.

Sodium Formate or Formate of Soda

possesses similar properties, and is used for the same purposes as acetate of soda. It is marketed in a very pure quality.

Sodium Phosphate or Phosphate of Soda.

This salt forms crystals which effloresce in the air, and are soluble in 25 times their weight of cold water or in their own weight of boiling water. Phosphate of soda is a weak alkaline salt, which is used sometimes in the place of Glauber's salt when dyeing light shades with Diamine Colours; it is also applied in the weighting of silk.

Borax, Sodium Bi-borate or Bi-borate of Soda.

White crystals containing water of crystallisation, or a white anhydrous powder of moderate solubility in water; feebly alkaline salt, which affects the wool but slightly, and is therefore frequently used in the dyeing of Alkaline Blue in order to render the bath feebly alkaline as required for this dyestuff.

Sodium Perborate or Perborate of Soda.

Sodium perborate or perborate of soda, *perborate* for short, is a white powder very sparingly soluble in water, which contains in its pure state 10% active oxygen. More recently it is manufactured also in a crystalline form. It reacts alkaline, and on being heated easily emits oxygen, thus exercising a strong bleaching action similar to hydrogen peroxide. On this account it is recommended as a bleaching agent in substitution for hydrogen or sodium peroxide, and also as an addition to washing powders. It has the advantage over the former of excellent stability, and over the latter of safety in its application, which is also easier, because the product is simply put into the aqueous bath without the addition of acid.

On becoming moist or when in an impure state, perborate very soon loses oxygen.

Sodium Silicate or Silicate of Soda, Soluble Glass.

Silicate of soda as a rule is marketed as a colourless or slightly tinted glassy mass or as a thick aqueous solution frequently containing an excess of caustic soda deriving from its manufacture. It is very easily soluble in water, but not deliquescent; the solution decomposes, particularly under the influence of the carbonic acid from the air, and separates silicic acid. Silicate of soda is an alkaline salt, and is used for the weighting of silk and other purposes. It is largely employed for fire-proofing and water-proofing textile materials.

Sodium Bisulphite or Bisulphite of Soda.

This product is usually marketed under the denomination of metasulphite or pyrosulphite, in the form of white crystals which decompose with the evolution of heat on exposure to the air.

In the dyehouse the aqueous solution of sodium bisulphite is used almost exclusively, which is either colourless or stained slightly yellowish by traces of iron and smelling of sulphurous acid, generally containing 22—23% sulphurous acid and showing a specific gravity of about 64° Tw. Bisulphite is used in large quantities for the bleaching of wool and for preparing hydrosulphite solution. It is sometimes also used in order to remove hypochlorous acid from bleached materials.

Hydrosulphite conc. powder.
Sodium Hydrosulphite or Hydrosulphite of Soda.

Sodium hydrosulphite, which we deliver as *Hydrosulphite conc. powder,* keeps well in the solid state (contrary to its solution) if protected against moisture. In moist air, and particularly in aqueous solution, it is very apt to oxidise, and it should therefore be kept dry in a closed receptacle. It dissolves very easily in water. Solutions should not be kept on stock, but should be prepared for each case immediately before use.

Hydrosulphite is a very powerful reducing agent, and is used chiefly for dissolving and dyeing Hydron Colours. As it has a destructive effect on a good many colours, it may be used also for stripping the colour off dyed materials.

For this purpose the solution may be prepared for direct use by pouring a solution of

10 gallons bisulphite 64° Tw. and
10 gallons cold water over
10 lbs zinc dust,

stirring for a short time, allowing to settle, and using the clear solution, filtered if necessary. For every 100 gallons water, 4—6 gallons hydrosulphite

and ½ gallon acetic acid are added; enter the goods, heat to 50—60° C. (120—140° F.), and work for ¼ to ½ hour until the colour is stripped enough; then rinse well.

Sodium Thiosulphate, Hyposulphite of Soda, Antichlor.

Sodium thiosulphate is a very easily soluble, well crystallising salt; acid causes it to decompose separating sulphur and sulphurous acid, and it is therefore used for mordanting wool with sulphur before dyeing with Solid Green or Brilliant Green (see page 16).

Potash, Potassium Carbonate, Carbonate of Potash.

Potash is produced from wood ash or potassium chloride, and forms a white mass absorbing water from the air, and very deliquescent. Apart from its great solubility and deliquescence, it is very similar to soda in its behaviour.

Potash soaps are milder than soda soaps, and are therefore frequently given the preference for washing and milling the undyed wool. Mild soaps for washing and milling wool are frequently prepared from oleïne (crude oleïc acid) and potash (see pages 220 and 246).

Tartar, Cream of Tartar, Potassium Bitartrate, or Bitartrate of Potash, Argol.

Tartar is the acid potassium salt of tartaric acid, and is produced by refining the sediment resulting from the fermentation of wine. In its natural state the substance is known as argol (red or white, according to the colour).

Tartar is very sparingly soluble in cold water, and even at 100° C. (212° F.) 100 parts water dissolve no more than 6.9 parts tartar.

Tartar is used as an assistant in chrome mordanting, as it causes the bichrome to go better on

to the fibre, and by reduction brings it at the same time into a form suitable for fixing the dyestuffs.

Of late, lactic acid, lactoline, formic acid, oxalic acid, lignorosine and other substances have been frequently used with much success.

Ammonium Acetate or Acetate of Ammonia.

Crystals which are exceedingly soluble in water and deliquescent in the air. The solution of the salt smells of ammonia, and turns red litmus paper faintly blue. The solution is sold in the market, but may easily be prepared by mixing

10 oz ammonia (0.913 sp. gr. or 24%) and
28¼ oz acetic acid (8° Tw. or 30%).

The solution should not materially change either blue or red litmus paper.

Acetate of ammonia serves for mildly acidulating the dyebaths of Alphanol Blue, Diamine Colours, etc., and for stripping colours off wool and silk.

Ammonium Oxalate or Oxalate of Ammonia.

Ammonium oxalate is a well crystallised salt which dissolves readily at 15° C (59° F.) in 24 times its weight of water. The solution of the salt may be prepared by dissolving

1 lb oxalic acid in
1 gallon hot water and neutralising the solution with about
1⅛ lbs ammonia (0.913 sp. gr. or 24%);

this solution should not change either blue or red litmus paper, and contains about 1⅛ lbs oxalate of ammonia crystals.

The salt is used principally in the dyeing of some Chrome Colours, in order to precipitate the lime salts contained in hard water, thus rendering them innocuous.

Ammonium Sulphocyanide.

This salt forms colourless, very freely soluble leaflets. It is chiefly applied in wool dyeing in order to reduce the effect of metallic copper on certain dyestuffs, by forming a sort of coating of sulphocyanide of copper, which protects the copper. Care should therefore be taken, if possible, not to remove this coating when cleaning copper vessels by polishing them.

Magnesium Chloride.

Very easily soluble and deliquescent crystals which decompose on heating in the presence of moisture, generating hydrochloric acid. It is used as an addition to cotton dressings and sizings to protect the goods from becoming mouldy, and for weighting. In hot finishing on the calender, magnesium chloride, as indicated above, is likely to generate hydrochloric acid and thus affect the vegetable fibre; on this account, magnesium chloride is not always safe to use and is sometimes substituted by calcium chloride or Epsom salt.

Epsom Salt, Magnesium Sulphate or Sulphate of Magnesia.

Epsom salt is an easily soluble salt which is marketed in the form of crystals or a crystalline powder. It is sometimes used as an addition to sizing agents, when magnesium chloride cannot be used, on account of the risk of tendering the fibre (see magnesium chloride); it must therefore be free from any magnesium chloride.

Calcium Chloride.

This is a very easily soluble salt which is formed by the action of hydrochloric acid on lime and chalk and is obtained as a waste product in many chemical processes. It is sometimes used as a substitute for magnesium chloride in finishing, because it does not separate hydrochloric acid at an elevated temperature.

Barium Chloride.

Barium chloride forms colourless crystals resistant to air, dissolving in about three times their weight of cold water and somewhat more copiously in hot water. It forms with sulphuric acid and the salts thereof a white insoluble precipitate of barium sulphate or sulphate of baryta (blanc fixe). It is employed largely as a precipitating agent for colour lakes.

Alum.

Commercial alum is sold either as potash alum or as ammonia alum, which show practically no difference in their properties.

The solubility of alum is shown in the following table:

100 parts of water dissolve at

50°	68°	86°	104°	158°	212° F.	
9.5	15.1	22.0	30.9	90.7	357.5	**parts potash alum**
9.1	13.6	19.3	27.3	72.0	421.9	**parts ammonia alum.**

Alum is used for increasing the fastness to water of dyed shades and also for water-proofing; it is further employed as a weakly acid salt in the place of free acids, for instance in the dyeing of Basic Colours on cotton, of Acid Colours on jute and in wool-printing.

Aluminium Sulphate or Sulphate of Alumina.

Aluminium sulphate has the same properties as alum, but is stronger than the latter, 100 parts of aluminium sulphate being equivalent to 140—150 parts of alum; it is very easily soluble in water. Aluminium sulphate sometimes contains an excess of sulphuric acid or small amounts of oxide of iron and Glauber's salt; it usually contains 50% pure aluminium sulphate, sometimes even more than 55%.

Sulphate of alumina among other things is used for the production of colour lakes.

Aluminium Acetate or Acetate of Alumina.

This is known only in form of its aqueous solution, and is usually prepared by mixing aluminium sulphate with lead acetate (sugar of lead) or calcium acetate; for instance, 171 parts sugar of lead are used per 100 parts of aluminium sulphate, the two being mixed together in aqueous solution and allowed to settle, whereupon the clear solution is drawn off for use. In order to free the solution entirely from lead, a small amount of Glauber's salt in solution may be added subsequently.

Acetate of alumina is frequently used for waterproofing. The purer the product, the stronger is its effect; on this account the solution is to best advantage prepared for this purpose with aluminium hydroxide and acetic acid.

Chrome Alum.

Chrome alum is obtained as a waste product in various chemical manufactures; it forms dark crystals which in spite of their beautiful, crystalline form may contain a great many impurities, more particularly calcium sulphate, tarry and other organic substances and free sulphuric acid.

One part of chrome alum dissolves in 7 parts cold or 2 parts boiling water.

Chrome alum is used sometimes for fixing Chrome Colours, Diamine Colours and Immedial Black.

Chromium Fluoride.

Chromium fluoride is a green crystalline powder readily soluble in both cold and hot water, and has a corroding effect on glass and most metals.

Chromium fluoride is used chiefly in Vigoureux printing for fixing some of the Diamine Colours fast to washing and milling, Diamine Fast Red F and Diamine Green G in particular as well as some of the Chrome Colours. It is also used in the dyeing of a pure Yellow by means of Anthracene Yellow GG, which with chromium fluoride yields clearer shades

than with bichrome. It has been used sometimes in the place of bichrome as a chrome mordant, 4% chromium fluoride being used with the addition of 2% oxalic acid.

Chromium Formate or Formate of Chrome.

This salt is marketed as a greyish green powder, easily soluble in double its weight of water. It is applied in Vigoureux printing in the place of chromium fluoride and acetate of chrome for fixing Chrome and Vigoureux Colours, because it preserves the soft handle and the spinning capacity of the wool particularly well.

Chromium Acetate or Acetate of Chrome

is produced by dissolving chromium hydroxide in acetic acid or by the double decomposition of chrome alum with sugar of lead. Chromium acetate serves chiefly for fixing dyestuffs in calico and wool printing. It is exceedingly readily soluble in water.

Potassium Bichromate. Bichrome. Chrome. Red Chromate or Bichromate of Potash.

Potassium bichromate crystallises in large yellowish red crystals which are stable when exposed to the air and contain no water of crystallisation. 100 parts of water dissolve at

32°	50°	104°	176°	212° F.
5	8.5	29.4	73	102 parts bichrome.

The commercial product is practically chemically pure.

Bichrome is used for chrome mordants, as well as for fixing Chrome Colours, Diamine, Immedial and Hydron Colours; it is also used for stripping colours off shoddy goods.

Sodium Bichromate or Bichromate of Soda. Bichrome. Chrome.

Sodium bichromate, contrary to potassium bichromate, forms deliquescent crystals containing water of crystallisation, and is more easily soluble and cheaper than the potassium salt, for which reason it is frequently used in place of the latter.

It is usually marketed in a strength equal to that of potassium bichromate, but not always of the same purity.

100 parts of water dissolve at

32°	59°	86°	176°	212° F.	
107	109	127	143	163	**parts sodium bichromate.**

Sodium bichromate is applied in exactly the same manner as potassium bichromate, and has the same effect.

Copperas or Green Vitriol. Ferrous Sulphate.

Copperas is obtained by dissolving iron in diluted sulphuric acid, and on a large scale from iron pyrites. It forms bluish green crystals which easily decompose when exposed to the air and become brownish by oxidation. It is easily soluble in water, but quickly oxidises on exposure to the air, separating red ferric hydrate.

Copperas is used in dyeing chiefly as a mordant and fixing agent for dye-woods and for the preparation of the copperas vat. It further serves for the weighting of silk.

Pyrolignite of Iron, Iron Liquor or Black Liquor.

This is a dark olive brown liquid with a peculiar smell. The commercial product usually has a specific gravity of 20—30° Tw. It is sometimes used for the weighting of silk.

Nitrate of Iron. Basic Ferric Sulphate.

Nitrate of iron derives its name from being prepared by the oxidation of ferrous sulphate by means of nitric acid. It is however not a nitrate but a sulphate, and is marketed as an aqueous solution of about 80° Tw. It is used very largely as a mordanting and weighting agent for black silk, and is sometimes employed in the place of copperas for the fixing of tannin matter and the production of chamois and Nanking yellow shades.

Copper Sulphate. Cupric Sulphate or Sulphate of Copper. Bluestone or Blue Vitriol.

Bluestone forms blue transparent crystals soluble in water.

100 parts of water dissolve at

50°	68°	86°	122°	158°	194°	212° F.
37	42	49	66	95	156	203 parts of blue vitriol.

Copper sulphate is used for increasing the fastness to light of some of the Diamine and Immedial Colours, and for fixing wood colours, in the latter cases mostly in combination with copperas; further, in wool-dyeing for increasing the fastness to steaming (decatising) and perspiration of some dyestuffs, such for instance as Naphtyl Blue Black (all brands), Naphtylamine Black R, RNB, NBB, Alphanol Black and Alphanol Blue.

When using copper sulphate for aftertreating Diamine Colours, care has to be taken that the baths are feebly acid and that they do not become turbid.

Copper sulphate improves the fastness to light of a number of colours to a very high degree, but this is not the case with every dyestuff.

Tin Crystals or Tin Salt. Stannous Chloride.

This salt is prepared by dissolving tin in hot hydrochloric acid. It dissolves completely in one-third its weight of water; the pure solution is rendered turbid when being diluted, through the dissociation of the salt, but on adding hydrochloric acid it becomes clear again.

Tin crystals are still used occasionally as a discharging agent.

Tetrachloride of Tin. Perchloride of Tin.

This is used in the form of very pure crystals or of solutions, or else in the form of a double salt together with ammonium chloride known as "pink salt". It is exceedingly easily soluble in water, and is used largely for the weighting of silk, and further as a substitute for tartar emetic.

Lead Acetate or Acetate of Lead. Sugar of Lead.

White crystals which dissolve in double their weight of cold water. If calcareous water is used, a little acetic acid should be added in order to ensure clear solutions. Sugar of lead like all other lead combinations is poisonous.

Basic acetate of lead is prepared by boiling the solution of 3 lbs sugar of lead in 1 gallon water along with 1 lb litharge and bringing with water to the desired strength (about 50° Tw.).

Nitrate of Lead.

Small round white lumps soluble in double their weight of cold water. Used for the same purposes as sugar of lead and likewise poisonous. *Basic nitrate of lead* is obtained by boiling its solution with litharge.

Tartar Emetic.

Tartar emetic, the double tartrate of antimony and potassium, is a crystalline salt not very soluble in cold water, but more so in hot water. One part of tartar emetic requires for dissolving at

48°	70°	88°	122°	167° F.
19	12.6	8.2	5.5	3.2 parts of water.

Tartar emetic is used for fixing tannic acid for various purposes, and more particularly in the dyeing of Basic Colours on cotton.

The corresponding *sodium salt of tartar emetic*, on account of its much greater solubility, is given the preference for printing purposes.

The effective substance of tartar emetic is the antimony oxide, of which 43.4% are contained in the pure salt. The commercial product consists either of fine crystals or irregular pieces containing 43% antimony oxide; tartar emetic, adulterated with

cheaper antimony salts or entirely valueless substances, is also occasionally met with in the market.

Tartar emetic and the other antimony salts are poisonous, but there is no risk of poisoning if the goods are tolerably well rinsed, after mordanting, as has been proved by many years' experience.

The valuation of tartar emetic and other antimony salts is based on the amount of antimony they contain, which can only be determined by an exact analysis.

Substitutes for Tartar Emetic.

Tartar emetic is relatively expensive on account of the high cost of tartar used in its manufacture, and has been replaced successfully by cheaper antimony salts which have the same effect. Some double salts of antimony fluoride, antimony oxalate and antimonine are the substitutes most in use.

Antimony salt, a double salt of antimony fluoride and ammonium sulphate (of E. de Haën) forms white crystals, of which 140 parts dissolve in 100 parts water. The solution reacts strongly acid, and corrodes glass and metals. Antimony salt contains 47% antimony oxide, and 9 parts antimony salt correspond to nearly 10 parts tartar emetic.

Patent salt, double antimony fluoride or antimony sodium fluoride (of R. Koepp & Co.) is a very easily soluble, crystalline salt, and also corrodes glass and metals. It contains 66% antimony oxide, 65.8 parts double antimony fluoride thus corresponding to 100 parts tartar emetic.

In addition to these two products there are a number of other double salts of antimony fluoride in use.

Of these salts, about 5—20 parts are dissolved in 1000 parts water, and as they are very acid, about 6—8% of their weight of soda ash are added, or just enough for the bath to begin to show signs of becoming turbid.

Antimonine or Antimonyl Calcium Bilactate (C. H. Böhringer Sohn, Ingelheim o. Rh.) is marketed containing 15% of antimony oxide. It is crystalline, hygroscopic and very readily soluble, and is to be used like the other tartar emetic substitutes, but in a weak acid solution, viz. with the addition of ¼ gallon of acetic acid per 250 gallons liquor.

Bleaching Powder or Chloride of Lime. Calcium Hypochlorite.

Chloride of lime is a white powder smelling of chlorine, which should be free from lumps. On exposure to the air, it absorbs moisture and carbon dioxide, forming then a doughy mass. Mixed with a little water, it evolves heat, and dissolves in 20 times its weight of water, a considerable residue always remaining. Chloride of lime should contain 35 to 39% active chlorine. It decomposes gradually when stored thereby losing in strength; the decomposition may even assume the character of an explosion.

For preparing a solution, mix 1 part bleaching powder to a perfectly smooth paste with 3 parts water, and dilute with 3 parts more of water; after settling, the pure solution is diluted to the desired strength.

Chloride of lime is used for bleaching vegetable fibres, and for chloring wool and hair; see for instance pages 120 and 163.

The following method of testing the hypochlorite liquors in the bleach-house has been proposed by R. Baur: For the titration of the bleaching liquors in use, a "thiosulphate" burette graduated into $^1/_5$ c.c. and a "chlorine tube" are required. The latter is a glass tube of about 1½ cm. ($^3/_5$ inch) inside

width and 50 cm. (20 inches) in length, and closed at one end. Hydrochloric acid, potassium iodide and a thiosulphate solution containing 6.95 grms sodium thiosulphate in 1 litre water are used for testing. This solution, each c.c. of which corresponds to 1 mg. (0.001 grm.) of active chlorine, is filled into the "thiosulphate burette". The "chlorine tube" is filled with 10 c.c. of the old chlorine liquor from the bleach-house, and a few c.c. of solution of potassium iodide are added until, on gently shaking, the liquor no longer becomes brown or turbid. When this point has been reached, a few c.c. of hydrochloric acid are added, until the turbid liquor has become quite clear (brown). The thiosulphate solution is now added, pretty quickly at first and then drop by drop, until the colour, which on moderate shaking had gradually turned a paler yellow, suddenly disappears. Each c.c. of sodium thiosulphate solution added indicates 1 mg. (0.001 grm.) of active chlorine in 10 c.c. of bleaching liquor.

Sodium Hypochlorite. Hypochlorite of Soda. Eau de Javelle.

Sodium hypochlorite is known only in the form of its aqueous solution, which is produced either by the electrolysis of common salt or by mixing the solutions of chloride of lime and soda.

100 lbs chloride of lime 33% are mixed with 40 gallons water, and 60 lbs soda ash are dissolved in 20 gallons boiling water and diluted with 10 gallons cold water. The soda solution is added to the paste of chloride of lime, and the mixture stirred for ½ hour and allowed to settle overnight. The clear solution is drawn off and the precipitate washed 4 or 5 times with a small quantity of cold water, and allowed to settle again, the clear liquid being added to the first liquor, obtained direct from the precipitation and the whole being brought with cold water to about 150 gallons of 6—7° Tw. It may be freed entirely from lime by the addition of 1—2 lbs soda ash, any lime remaining being precipitated in the form of calcium carbonate.

Hypochlorite of soda, like chloride of lime, is used for bleaching vegetable fibres, but is not suitable for chloring the wool. As compared with chloride of lime, it offers the advantage that it can be easily obtained in form of a clear solution free from lime.

Sulphur.

Sulphur is marketed either as sulphur in sticks, in large pieces, or as a crystalline powder in the shape of sublimated sulphur (flowers of sulphur).

It melts at 114.5° C. (238° F.), and sublimates and evaporates at higher temperatures. If ignited or if heated when exposed to the air, it burns with a blue flame not giving much light, forming sulphur dioxide gas usually known as "sulphurous acid".

The bleaching effect of sulphur on wool, silk, straw and the like is due to the production of this gas when burning the sulphur in stoving chambers. The burning of the sulphur should be so regulated as to prevent heat developing in excess and to thus avoid the sublimating of sulphur on the goods. The sulphur when used for bleaching or stoving is best ignited by means of red-hot iron or coal.

Hydrogen Peroxide or Peroxide of Hydrogen.

Hydrogen peroxide is used as a colourless aqueous solution prepared by the action of dilute sulphuric acid on barium peroxide, or sometimes sodium peroxide. The action of hydrogen peroxide is based on its property to readily develop oxygen, and it is therefore used for bleaching. The strength of the commercial solution is usually expressed in volumes of oxygen evolved by 1 volume of the liquid, the usual strength of 12 volumes corresponding to 3% hydrogen peroxide. Of late, hydrogen peroxide corresponding to 70 volumes of oxygen is likewise being marketed.

The product keeps best at a low temperature, in the dark and if acidulated with small quantities of acid. An addition of 1½ oz naphtalene or 1 pint of alcohol or ether to 10 gallons of the solution improves its stability. In the presence of alkalies or

on heating, it readily gives off the oxygen it contains, and as certain metals have a decomposing effect on hydrogen peroxide. it is best to keep it in well-tarred casks or in carboys.

Hydrogen peroxide is used for bleaching the various kinds of fibres, particularly silk, tussah silk, wool and hair.

Sodium Peroxide

is a white deliquescent powder which absorbs carbon dioxide with the evolution of oxygen. It dissolves in water with generation of heat, and on boiling develops oxygen. On sufficiently cooling, it dissolves in acidulated water forming hydrogen peroxide and the corresponding sodium salt. It is frequently employed therefore in place of the latter for bleaching. When brought into contact with inflammable substances, like paper etc., it ignites them, and as it is moreover apt to decompose with a detonation without any apparent cause, it should be handled with care.

Sodium peroxide develops 20 per cent by weight of oxygen, whereas hydrogen peroxide of 12 per cent by volume only yields 1½ per cent by weight of oxygen. In addition, sodium peroxide possesses the advantage of remaining stable for an indefinite period when properly stored.

Sodium peroxide is used for the same purposes as hydrogen peroxide.

Potassium Permanganate or Permanganate of Potash.

Brilliant steel-blue, well-nigh black crystals which dissolve in 15 to 16 times their weight of cold water, with an intensely blue-red colour.

Permanganate of potash is a very strong oxidising agent, and for this reason is applied sometimes also for bleaching purposes (see page 129); the brown precipitate, viz, manganese peroxide which forms on the goods is very easily dissolved and removed by sulphurous acid or an acidulated solution of bisulphite.

Hyraldite.

Hyraldite is a stable formaldehyde compound of hydrosulphite, and serves for discharging and also for stripping (see pages 3—5).

It is marketed in the following brands:

Hyraldite A
Hyraldite C extra
Hyraldite CL .
Hyraldite Special
Hyraldite W
Hyraldite CW extra
Hyraldite Z for Stripping
Hyraldite Z soluble conc.

Hyraldite A, C extra, CL and Special are easily soluble in water; the "W" brands are partially soluble. Hyraldite Z for Stripping is insoluble in water and keeps exceedingly well; Hyraldite Z soluble conc. is soluble in water, and likewise keeps exceedingly well.

Hyraldite should be kept in a cool place in closed vessels.

Hyraldite A and the double strength brand *Hyraldite C extra* serve for discharging and also for stripping. *Hyraldite Z for stripping* and *Z soluble conc.* are used especially for stripping; the other brands are used for discharging purposes only.

For particulars about *discharging* see Vol. IV.

The stripping is described at the commencement of this volume (pages 3—5).

Soap.

Soaps are usually classed as hard or soda soaps and soft or potash soaps. The latter practically all contain impurities from the raw materials, for instance excess alkali and glycerine, and are therefore only used where these impurities cannot have any injurious effect and where the unpleasant smell they leave on the goods does not signify.

Hard soaps are purified soaps, but frequently very imperfectly freed from excess alkali and glycerine.

Frequently the soaps are prepared in textile works by boiling oleïne (crude oleïc acid) with soda lye according to the following recipe:

30 lbs oleïne
12 lbs caustic soda lye of 77° Tw.
16 gallons water.

The lye is boiled up with one-half of the water, and the oleïne is added gradually with continuous stirring. When no lumps of soap are left, the other half of the water is added, stirring being continued for at least another hour. For rendering the combination of the oleïne and the lye complete, prolonged boiling is essential. Soda or potash may be employed in the place of caustic soda lye for producing soap together with oleïne.

A good hard soap must possess the following properties: It must contain a high percentage of soap proper, i. e. alkali salts of fatty acids, and be free or fairly free from unsaponified fat, free alkali, common salt, glycerine and other impurities such as silicate of potash, starch, clay, etc. No hard and fast rules can however be given regarding the composition of the soaps, which is very variable. Generally, good qualities of soap should contain approximately:

60—70% fatty acid
6— 8% alkali, calculated as caustic soda
20—30% water.

The German Soap-makers' Union recently determined the following definitions for "curd soaps" and "soft soaps":

Under the denomination of "curd soap" only such soaps may be marketed as are produced solely from solid or liquid fats or fatty acids with or without the addition of resin and are technically pure and in a fresh state contain at least 60 percent of soap-forming fatty acids including resin acids. Additions of salts, soluble glass, flour or similar filling materials are not permissible.

Soaps which do not answer to the above definition must not contain the word "curd soap" in their trade-designation.

All hard soaps designated as "pure" must answer the above definition at the very least.

As "pure" soft soaps only such can be marketed as contain at least 38 percent of fatty acids, including resin acids, and are technically pure; additions of soluble glass and flour in particular are inadmissible.

As "ground curd soap" only such soaps are marketable which are obtained by grinding down curd soaps or other soaps of equal value without adding any other ingredient.

When a soap is not guaranteed free from resin, resinous acid is counted like fatty acid in the determination of the percentage of fatty acid. A calculation for reducing to fatty acid anhydrides does not take place.

An exact valuation of the soap can be carried out by chemical analysis only. In order to determine approximately the quantity of the free alkali, 10 grms of the soap are dissolved in hot, pure alcohol, filtered, and tested with phenolphtaleïne solution. If the solution turns red, this indicates the presence of free caustic alkali, although slight quantities are not enough to produce a red colouration. The solution may be titrated with acid to determine the amount of free alkali present. Any soda present will remain on the filter, likewise most of the adulterations that come into consideration.

Turkey-red Oil.

Turkey-red oil is prepared by treating castor-oil with sulphuric acid, and is marketed in the form of an oily liquid easily soluble in water containing caustic soda lye or ammonia. It contains approximately 50—65% of Turkey-red oil. A good quality should contain at least 50% Turkey-red oil. It is

used for various purposes in dyeing, amongst others for the levelling of shades. As compared with soap, it has the advantage of being less apt to form precipitates in calcareous water.

Universal Oil. Monosolvol. Avirol. Monopole Soap.

Under these and other denominations, various preparations soluble in water are marketed in a liquid or solid form, which are all in character similar to Turkey-red oil; they are distinguished especially by their property of being but slightly sensitive to lime, and in this respect superior to Turkey-red oil. They are less apt to form precipitates with lime and magnesia salts, and have the property to re-dissolve lime or magnesia soaps that may have formed. These products are not decomposed by the quantities of common salt or acids customary in dyeing and finishing. Owing to these properties they are used extensively and in large quantities for dyeing and finishing, as substitutes for Turkey-red oil. In the wool-dyeing trade they are used sometimes in quantities of 2—3%, reckoned on the weight of the goods, as an addition in dyeing Acid Colours and Chrome Colours with a view to promote the levelness of the shades and preserve the soft handle of the wool.

Tetrapol. Nettolavol. Oxyvol.

These are mixtures of tetrachloride of carbon and soaps soluble in water, which bring into use the property of tetrachloride of carbon to dissolve fat and oil in aqueous baths also. Exceedingly well suited for removing spots and thoroughly removing non-saponifiable fats and oils from wool, especially from fabrics and yarns. When scouring impure goods, about ½—1 lb tetrapol may for instance be added for a piece of 50—60 lbs weight, the goods otherwise being worked in the usual manner.

Boiled-off Liquor.

Boiled-off liquor is the name for soap liquors which have been used for the degumming of silk and which thus contain some gum from the silk in

addition to the soap. This boiled-off liquor is a favourite addition to the dyebaths intended for dyeing silk, as in such bath brighter shades are obtained and the dyestuffs go more evenly on to the silk than in the ordinary aqueous bath. Contrary to acidified soap baths, the boiled-off liquor when acidified until showing a weakly acid or neutral reaction, is of an even mucillaginous condition. As boiled-off liquor is very apt to become putrid, it is not a regular article of trade, and dye houses which do not produce boiled-off liquor in sufficient quantities for their purposes prepare substitutes which may for instance be produced according to the following recipe:

3 lbs soap, 10 oz gelatine or glue, 3—4 oz olive-oil and 3—4 oz common salt are boiled up well with 10 gallons water. This solution is used in the same way as boiled-off liquor. For acidifiying this substitute, the requisite sulphuric or acetic acid should be added but slowly whilst continually stirring.

Tannins.

This group comprises a number of organic acids derived from the vegetable kingdom, which are all similar in their chemical character, and are distinguished in general by their properties to convert animal skin into leather, to precipitate albumen and glue, alkaloids and Basic Colours from their solutions, and together with ferric acetate to yield blue-black or dark green precipitates; other distinguishing features are their strong astringent taste and their feebly acid reactions towards litmus as also their strong reducing power.

In the dye-house the tannins are principally used on account of their property to yield insoluble compounds with certain metallic oxides and dyestuffs as mordants and weighting agents. (Cutch and Gambier also belong to the group of tannins.)

The tannins are usually coloured to some extent and consequently impart a yellowish or brownish tone to the goods treated with them. For the

production of light and brilliant shades, tannic acid is therefore used principally, which is the purest and the least coloured of the tannins, as also decoctions of gall-nuts and decolourised sumac extract, whereas for deeper shades leaf sumac, ordinary sumac extracts, myrabolans, knoppern, valonias, etc. are given the preference as being cheaper.

The most important tannins for the dye house are the following:

1. *Tannic Acid*, or *Gallo-Tannic Acid.* Tannic acid is found in many parts of plants holding tannin, particularly in gall-nuts and in the pure sumac (from Rhus coriaria), and is obtained principally from the gall-nuts in Eastern Asia, which are very rich in tannic acid.

It is marketed in the form of a light coloured powder or of yellowish to brownish scales or again as a brittle, glassy substance of a brownish colour or as a spongy mass. When exposed to the air it gradually becomes darker. It dissolves in 6 times its weight of cold water, and more easily so in hot water; in dilute alcohol, dilute acetic acid or glycerine it dissolves very freely. The aqueous solution decomposes gradually when left standing. Alkaline solutions become strongly discoloured.

The better kinds of commercial tannic acid contain about 65—85% tannin. Good tannic acid yields a clear solution in water or in alcohol containing water, and on being reduced to ashes leaves but little residue. There are however very efficient qualities on the market which do not yield a perfectly clear solution in water. Pure gallo-tannic acid yields a clear solution in a mixture of equal parts of alcohol and ether, while most of the impurities and adulterations — gallic acid excepted — are not dissolved thereby.

2. *Gall-nuts* or *Galls* are ball-shaped abnormal growths on different plants caused by the sting of insects when depositing their eggs; they should be collected before they have been pierced by the young

insect. Of the oak gall-nuts, the green or black Aleppo and Levante gall-nuts are the best, which contain about 55—60% gallo-tannic acid. The Hungarian, Italian, French and German gall-nuts are very much poorer in tannic acid. The Chinese and Japanese galls contain up to about 80% gallo-tannic acid and are used principally for the manufacture of pure tannic acid and for weighting silk.

3. *Sumac.* Next to pure tannic acid, sumac is the tannin most generally used in dyeing. The sumac from rhus coriaria is the best, and contains gallo-tannic acid. The finest quality, and at the same time the least coloured, is the Sicilian sumac; next to it comes American sumac, as well as the Greek, Spanish and Portuguese sumac. Of less value are the sumacs from coriaria myrtifolia and rhus cotinus obtained in Hungary, the Tyrol and the Provence.

Commercial sumac usually consists of the whole, broken-up, or sometimes also powdered leaves of the plant; the stalks of the leaves and small twigs are very often mixed up with the rest. The good kinds have an olive-green colour and a fresh, agreeable smell; they contain 15—20%, even sometimes more than 20% tannin. Sumacs, which are dull in colour and have a musty smell, have deteriorated by moisture and too long storing.

Sumac is used principally as a tannin for dark shades; the dull red colour which the sumac contains usually interferes rather with light and brilliant shades.

Sumac Extract is sold as a thick dark brown liquid of about 52° Tw. or in a solid state. Decolourised sumac extracts may as a rule replace the tannic acid, even for bright shades.

Liquid sumac extract is rather apt to ferment, losing thereby in strength.

4. *Myrabolans* are the fruit of various Chinese and East Indian plants which are marketed in a dry state and in powder form. They contain about 25—45% ellagi-tannic acid and also a yellow-brown dyestuff. It is sometimes used for black dyeing of the cotton warp in half-wool pieces, and for covering burls.

5. *Chestnut Extract* is derived from the wood of the chestnut-oak which contains about 8—10% of a tannin substance the nature of which is not fully known. The solid extract possesses a shining black colour; in the liquid state it represents a brown syrup. The extracts become turbid when diluted, and separate brown substances, so-called "phlobaphenes", which apparently take an active part in some way in the weighting and dyeing process.

Chestnut extract is the most important tannin matter for weighting and dyeing of black silk.

The above tannins, as also several others, are used largely for dyeing cotton and for weighting silk, more particularly black silk.

The *value of the tannins* varies a good deal according to the amount of tannic acid they contain; it is immaterial in estimating their value whether they contain gallotannic or ellagitannic acid. For many purposes the amount of dirty colouring matter contained in the tannins is likewise a consideration. When stored for a prolonged time, principally in damp, close places, the tannins are deteriorated through the decomposition of the tannic acid.

The value of the tannins is best determined by an exact titration with permanganate and by making dye-tests.

For *testing by dyeing*, dissolve carefully weighed quantities of the tannin to be tested and of the quality with which it is to be compared (of pure tannic acid about 0.3 grm.) in hot water. Fill up with water to 250 cc., add 10 grms. common salt and 2½ cc. glacial acetic acid (or about 5 cc. good

acetic acid) in each vessel, and mordant therein 10 grms of cotton yarn, previously well boiled, for 3 hours, the liquid meanwhile being allowed to cool off; then wring off each hank by itself, without however rinsing, and turn them in a glass containing 200 cc. nitrate or pyrolignite of iron of 1½—3° Tw. for 15 to 20 minutes, rinse, and dry; the strength of the tannin is then estimated from the depth of the shade of the cotton.

In order to determine whether the material is suited for light shades, fix it with antimony instead of iron salts, and dye with Basic Colours, for instance New Methylene Blue GG or Irisamine G; it will then be found that one tannin is sometimes more suited for blue, and another more for red shades.

Amyl Acetate

is an ethereal liquid of peculiar odour which boils at a temperature of 140° C. (285° F.); it is used as a dissolving agent for nitrocellulose in the production of collodion varnish.

Formaldehyde or Formaline

is marketed as a colourless, aqueous solution with a pungent odour causing irritation to the nose and eyes. The solution is generally delivered in a 30 to 40 percent concentration. It is used as a disinfecting agent, for the aftertreatment of Diamine Colours on cotton for the purpose of increasing the fastness to washing, as an addition for chrome tanning, and in the dyeing of chamois leather with Immedial Colours, as well as for various other purposes.

Albumen.

According to its origin, albumen is separated into two different kinds, viz., egg albumen and blood albumen. The latter is rather stronger than the former, but may be bleached. Both kinds of albumen dissolve completely in cold water. The solutions coagulate when heated to a temperature exceeding 65° C. (150° F.).

Gum Tragacanth. Gum Dragon.

Gum tragacanth or gum dragon is the sap derived from various kinds of plants, forming flat leaf shaped or worm-like strings of a yellowish white or brown colour without any smell or taste. It is similar to gum arabic, but differs therefrom and from other kinds of gum considerably by the fact that it does not dissolve in cold water, but merely swells in water to a thick mucous mass. Gum tragacanth is employed as a thickening and sizing agent. In preparing the thickening, tragacanth is soaked for 24 to 48 hours in the proportion of 6—10 lbs per 10 gallons water and then boiled for several hours until a uniform mass is obtained. By continued boiling it becomes more soluble, but less mucous.

Shellac.

Shellac consists of thin brittle leaves or flat pieces with an orange-yellow, brownish red or leather brown colour. Shellac, bleached with chlorine and perfectly white in colour, is marketed in form of twisted sticks with a silky lustre. Dissolves readily in alcohol if left standing in a warm place, and also in water if some borax or ammonia be added. 1 lb shellac is heated with about 4 oz borax or 3 oz ammonia in water until completely dissolved.

Carragheen or Irish Moss,

sometimes erroneously called Iceland moss, is a greyish white, transparent lichen, conglomerated like horn, which dissolves almost completely in boiling water. Strong decoctions gelatinise. It is used for sizing purposes, particularly for leather; it combines readily with the hide fibre, and stiffens the leather without impairing either the leather or the colour.

Aluminium Hydroxide or Alumina Paste.

Aluminium hydroxide is produced by mixing the solutions of

3 lbs sulphate of alumina in
3 gallons water and
1½ lbs soda ash in
15 gallons water

at a temperature of about 70° C. (160° F.).

Add the soda to the sulphate of alumina whilst agitating, allow to settle, wash, filter, and finally press if necessary.

The percentage of the dry paste is determined by drying a sample.

Kaoline, China-clay, Fixing Clay, Green Earth.

Kaoline, China-clay and Fixing Clay are all white clays serving as bases for lakes. Green Earth is a clay the green appearance of which is due to its containing some ferrous oxide and which possesses the property of fixing Basic Colours fast to lime without any precipitating agent. It is particularly of importance for the production of green lakes fast to lime. (See page 189.)

Resin Soap (as used in the production of Lakes).

Boil 50 lbs resin and 13 lbs soda ash for about an hour with 30 gallons water until completely dissolved, and dilute to 50 gallons.

Comparison of the Thermometer Tables of Celsius (Centigrade), Fahrenheit and Réaumur.

Degrees			Degrees			Degrees		
Celsius	Fahrenheit	Réaumur	Celsius	Fahrenheit	Réaumur	Celsius	Fahrenheit	Réaumur
0	32.0	0.0	34	93.2	27.2	68	154.4	54.4
1	33.8	0.8	35	95.0	28.0	69	156.2	55.2
2	35.6	1.6	36	96.8	28.8	70	158.0	56.0
3	37.4	2.4	37	98.6	29.6	71	159.8	56.8
4	39.2	3.2	38	100.4	30.4	72	161.6	57.6
5	41.0	4.0	39	102.2	31.2	73	163.4	58.4
6	42.8	4.8	40	104.0	32.0	74	165.2	59.2
7	44.6	5.6	41	105.8	32.8	75	167.0	60.0
8	46.4	6.4	42	107.6	33.6	76	168.8	60.8
9	48.2	7.2	43	109.4	34.4	77	170.6	61.6
10	50.0	8.0	44	111.2	35.2	78	172.4	62.4
11	51.8	8.8	45	113.0	36.0	79	174.2	63.2
12	53.6	9.6	46	114.8	36.8	80	176.0	64.0
13	55.4	10.4	47	116.6	37.6	81	177.8	64.8
14	57.2	11.2	48	118.4	38.4	82	179.6	65.6
15	59.0	12.0	49	120.2	39.2	83	181.4	66.4
16	60.8	12.8	50	122.0	40.0	84	183.2	67.2
17	62.6	13.6	51	123.8	40.8	85	185.0	68.0
18	64.4	14.4	52	125.6	41.6	86	186.8	68.8
19	66.2	15.2	53	127.4	42.4	87	188.6	69.6
20	68.0	16.0	54	129.2	43.2	88	190.4	70.4
21	69.8	16.8	55	131.0	44.0	89	192.2	71.2
22	71.6	17.6	56	132.8	44.8	90	194.0	72.0
23	73.4	18.4	57	134.6	45.6	91	195.8	72.8
24	75.2	19.2	58	136.4	46.4	92	197.6	73.6
25	77.0	20.0	59	138.2	47.2	93	199.4	74.4
26	78.8	20.8	60	140.0	48.0	94	201.2	75.2
27	80.6	21.6	61	141.8	48.8	95	203.0	76.0
28	82.4	22.4	62	143.6	49.6	96	204.8	76.8
29	84.2	23.2	63	145.4	50.4	97	206.6	77.6
30	86.0	24.0	64	147.2	51.2	98	208.4	78.4
31	87.8	24.8	65	149.0	52.0	99	210.2	79.2
32	89.6	25.6	66	150.8	52.8	100	212.0	80.0
33	91.4	26.4	67	152.6	53.6			

Comparison of Hydrometer Degrees Twaddle and Baumé with the Specific Gravities for Liquids heavier than Water.

Degrees Twaddle	Degrees Baumé	Spec. Gravity	Degrees Twaddle	Degrees Baumé	Spec. Gravity	Degrees Twaddle	Degrees Baumé	Spec. Gravity
1	0.7	1.005	58	32.4	1.290	116	53.0	1.580
2	1.4	1.010	60	33.3	1.300	118	53.6	1.590
4	2.7	1.020	62	34.2	1.310	120	54.1	1.600
6	4.1	1.030	64	35.0	1.320	122	54.7	1.610
8	5.4	1.040	66	35.8	1.330	124	55.2	1.620
10	6.7	1.050	68	36.6	1.340	126	55.8	1.630
12	8.0	1.060	70	37.4	1.350	128	56.3	1.640
14	9.4	1.070	72	38.2	1.360	130	56.9	1.650
16	10.6	1.080	74	39.0	1.370	132	57.4	1.660
18	11.9	1.090	76	39.8	1.380	134	57.9	1.670
20	13.0	1.100	78	40.5	1.390	136	58.4	1.680
22	14.2	1.110	80	41.2	1.400	138	58.9	1.690
24	15.4	1.120	82	42.0	1.410	140	59.5	1.700
26	16.5	1.130	84	42.7	1.420	142	59.9	1.710
28	17.7	1.140	86	43.4	1.430	144	60.4	1.720
30	18.8	1.150	88	44.1	1.440	146	60.9	1.730
32	19.8	1.160	90	44.8	1.450	148	61.4	1.740
34	20.9	1.170	92	45.4	1.460	150	61.8	1.750
36	22.0	1.180	94	46.1	1.470	152	62.3	1.760
38	23.0	1.190	96	46.8	1.480	154	62.8	1.770
40	24.0	1.200	98	47.4	1.490	156	63.2	1.780
42	25.0	1.210	100	48.1	1.500	158	63.7	1.790
44	26.0	1.220	102	48.7	1.510	160	64.2	1.800
46	26.9	1.230	104	49.4	1.520	162	64.6	1.810
48	27.9	1.240	106	50.0	1.530	164	65.0	1.820
50	28.8	1.250	108	50.6	1.540	166	65.5	1.830
52	29.7	1.260	110	51.2	1.550	168	65.9	1.840
54	30.6	1.270	112	51.8	1.560	169	66.1	1.845
56	31.5	1.280	114	52.4	1.570	170	66.3	1.850

Note:

The degrees in Twaddle's hydrometer bear a direct relationship to the specific gravity and may be obtained from the same by the following formula in which d represents the specific gravity and n the number of degrees Twaddle: $n = \frac{1000\ d - 1000}{5}$. On the other hand by the formula $d = \frac{5\ n + 1000}{1000}$ the degrees Twaddle are converted into the corresponding specific gravity. For values below 2.0 the degrees Twaddle may also be obtained from the specific gravity by moving the decimal point two figures to the right, striking off the first figure and multiplying the rest by 2, as per the following example:

Specific gravity 1.133:
113.3:
13.3 × 2:
26.6 ° Twaddle.

Comparison of Hydrometer Degrees Baumé with the Specific Gravity of Liquids lighter than Wetter.

Degrees Baumé	Spec. Gravity	Degrees Baumé	Spec. Gravity	Degrees Baumé	Spec. Gravity	Degrees Baumé	Spec. Gravity
11	0.993	16	0.960	21	0.930	26	0.901
12	0.987	17	0.954	22	0.924	27	0.896
13	0.980	18	0.948	23	0.918	28	0.890
14	0.973	19	0.942	24	0.913	29	0.885
15	0.967	20	0.936	25	0.907	30	0.880

Weights and Measures.

I. METRIC SYSTEM.

1 metre (m) = 10 decimetres (dm) = 100 centimetres (cm) = 1000 millilimetres [(mm).

1 litre (l) = 1000 cubic centimetres (cc. or ccm). 1 cubic metre (cbm) = 101000 litres.

1 gramme (g or gr or grm) = 10 decigrammes (dg) = 100 centigrammeses (cg) = 1000 milligrammes (mg).

1 kilogramme (kg or kilo) = 1000 grammes.

1000 kilogrammes = 1 ton (t) i. e. metric ton.

100 kilogrammes = 1 metric centner or quintal.

50 kilogrammes = 1 centner (or nearly 1 hundredweight).

10 grammes = 1 dekagramme (deka or dg). 100 grammes = 1 hectogrammme (hg).

The gramme is the standard unit of weight of the metric systeremm, and is equal to the weight of 1 cubic centimetre of pure water (measured v whilst at its greatest density, in vacuum under a latitude of 45 degrees, at sesea level). Hence the following relations of weights and measures are obtained:

1 cubic centimetre water = 1 gramme.

1 litre „ = 1 kilogramme.

1 cubic metre „ = 1 ton (metric ton).

II. ENGLISH WEIGHTS AND MEASURES.

1 yard (yd) = 3 feet. 1 foot (′) = 12 inches (″). 1 inch = 12 lines (‴).

1 yard = 91.44 centimetres. 1 foot = 30.48 centimetres. 1 inch = 2.2.54 centimetres.

1 metre = 1.094 yard = 3.281 feet = 39.37 inches.

1 Imperial gallon (gall.) = 4 quarts (qts) = 8 pints (pts) = 32 gills.

1 Imperial gallon = 4.544 litres. 1 litre = 0.220 Imperial gallon.

1 pint = 0.568 litre. 1 litre = 1.76 pints.

In England by the term gallon (gall.) the Imperial gallon is meannt, whilst in the United States of America the considerably smaller apothecary's s or wine gallon is usually understood by this term. In England the ton or grososs ton of 2240 lbs is also exclusively in use, whilst in the United States the tererm "ton"

may refer either to the gross ton of 2240 lbs or the short ton of 2000 lbs avoirdupois. The weights and measures used in this book always refer to the Imperial gallon, and to the gross ton of 2240 lbs.

1 wine gallon = 4 quarts = 8 pints.
1 wine gallon = 3.785 litres. 1 litre = 0.264 wine gallon.
1 pint (apothecary's measure) = 0.473 litre. 1 litre = 2.114 pints (apothecary's measure).
1 Imperial gallon = 1.2 wine gallon. 1 wine gallon = 0.8335 Imperial gallon.

1 pound avoirdupois (lb) = 16 ounces (oz) = 256 drachms (drm.)
1 pound avoirdupois = 7000 Troy grains (gr).
1 ton (gross ton) = 20 hundredweights (cwt) = 2240 lbs.
1 hundredweight = 4 quarters (28 lbs each) = 112 lbs.
1 ton = 1016 kilogrammes. 1 pound avoirdupois = 453.593 grammes.
1 ounce = 28.349 grammes. 1 Troy grain = 0.065 gramme.
1 kilogramme = 2.205 lbs avoirdupois. 1 gramme = 15.434 Troy grains.

1 Imperial gallon holds 10 pounds avoirdupois or 70 000 grains water (measured at 62° F. under a barometric pressure of 30 inches).
1 wine gallon holds only 8.35 lbs water.

III. RUSSIAN WEIGHTS AND MEASURES.

1 sagèn = 3 arshin = 7 feet.
1 foot = 12 inches. 1 arshin = 16 vershock.
1 foot = 30.48 centimetres. 1 inch = 2.54 centimetres. 1 Russian foot or inch equal to 1 English foot or inch respectively.
1 arshin = 71.12 centimetres. 1 vershock = 4.45 centimetres.
1 metre = 3.28 feet = 39.37 inches = 1.41 arshin = 22.50 vershock.
1 vedro = 8 stof = 12 quart = 30 krushki.
1 vedro = 12.30 litres. 1 stof = 1.54 litre. 1 quart = 1.02 litre.
1 litre = 0.0813 vedro = 0.9756 quart.
1 pood = 40 pounds (Russian). 1 pound = 32 lot = 96 solotnik.
1 pood = 16.38 kilogrammes. 1 kilogramme = 0.06 pood.
1 pound (Russian) = 409.51 grammes. 1 lot = 12.48 grammes. 1 solotnik = 4.16 grammes.
1 kilogramme = 2.44 pounds (Russian).

In Russian Poland the following weights and measures are used:

1 ell = 2 feet = 0.81 arshin = 12.96 vershock.
1 foot = 12 inches = 0.945 Russian foot = 11.34 Russian inches.
1 ell = 57.6 centimetres. 1 foot = 28.8 centimetres.
1 pound = 32 lots = 0.99 Russian pound = 405.50 grammes.
1 centner = 4 stone = 100 pounds = 2.476 pud.

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PERCENTAGE TABLES.

PERCENTAGE TABLES

This table provides the practical dyer with a convenient and exact method of converting percentages of colour into avoirdupois.

The following may serve as an example:

If 60 lbs of material are to be dyed with 1.69% of colour, proceed as follows:

For 10 lbs,	1 % equals	1 oz 263 grains	
" 50 "	1 % "	8 oz	
For 60 lbs,	1 % equals	9 oz 263 grains	9 oz 263 grains
For 10 lbs,	0.69% equals	1 oz 46 grains	
" 50 "	0.69% "	5 oz 228 grains	
For 60 lbs,	0.69% equals	6 oz 274 grains	6 oz 274 grains
	1.69%		15 oz 537 grains
			or 1 lb 99 grains

Per Cent	For 10 Lbs	For 50 Lbs	For 100 Lbs
10 %	1 lb.	5 lbs.	10 lbs.
9 %	14 oz. 175 grains	4½ lbs.	9 lbs.
8 %	12 oz. 350 grains	4 lbs.	8 lbs.
7 %	11 oz. 87 grains	3½ lbs.	7 lbs.
6 %	9 oz. 263 grains	3 lbs.	6 lbs.
5 %	8 oz.	2½ lbs.	5 lbs.
4 %	6 oz. 175 grains	2 lbs.	4 lbs.
3 %	4 oz. 350 grains	1½ lbs.	3 lbs.
2 %	3 oz. 88 grains	1 lb.	2 lbs.
1 %	1 oz. 263 grains	8 oz.	1 lb.
0.99	1 oz. 256 grains	7 oz. 403 grains	15 oz. 368 grains
0.98	1 oz. 249 grains	7 oz. 368 grains	15 oz. 298 grains
0.97	1 oz. 242 grains	7 oz. 333 grains	15 oz. 228 grains
0.96	1 oz. 235 grains	7 oz. 298 grains	15 oz. 158 grains
0.95	1 oz. 228 grains	7 oz. 263 grains	15 oz. 88 grains
0.94	1 oz. 221 grains	7 oz. 228 grains	15 oz. 18 grains
0.93	1 oz. 214 grains	7 oz. 193 grains	14 oz. 385 grains
0.92	1 oz. 207 grains	7 oz. 158 grains	14 oz. 315 grains
0.91	1 oz. 200 grains	7 oz. 123 grains	14 oz. 245 grains
0.90	1 oz. 193 grains	7 oz. 88 grains	14 oz. 175 grains
0.89	1 oz. 186 grains	7 oz. 53 grains	14 oz. 105 grains
0.88	1 oz. 179 grains	7 oz. 18 grains	14 oz. 35 grains
0.87	1 oz. 172 grains	6 oz. 420 grains	13 oz. 403 grains
0.86	1 oz. 165 grains	6 oz. 385 grains	13 oz. 333 grains
0.85	1 oz. 158 grains	6 oz. 350 grains	13 oz. 263 grains
0.84	1 oz. 151 grains	6 oz. 315 grains	13 oz. 193 grains
0.83	1 oz. 144 grains	6 oz. 280 grains	13 oz. 123 grains
0.82	1 oz. 137 grains	6 oz. 245 grains	13 oz. 53 grains
0.81	1 oz. 130 grains	6 oz. 210 grains	12 oz. 420 grains
0.80	1 oz. 123 grains	6 oz. 175 grains	12 oz. 350 grains
0.79	1 oz. 116 grains	6 oz. 140 grains	12 oz. 280 grains
0.78	1 oz. 109 grains	6 oz. 105 grains	12 oz. 210 grains
0.77	1 oz. 102 grains	6 oz. 70 grains	12 oz. 140 grains
0.76	1 oz. 95 grains	6 oz. 35 grains	12 oz. 70 grains
0.75	1 oz. 88 grains	6 oz.	12 oz.
0.74	1 oz. 81 grains	5 oz. 403 grains	11 oz. 368 grains
0.73	1 oz. 74 grains	5 oz. 368 grains	11 oz. 298 grains
0.72	1 oz. 67 grains	5 oz. 333 grains	11 oz. 228 grains
0.71	1 oz. 60 grains	5 oz. 298 grains	11 oz. 158 grains
0.70	1 oz. 53 grains	5 oz. 263 grains	11 oz. 88 grains

Per Cent	For 10 Lbs	For 50 Lbs	For 100 Lbs
0.69	1 oz. 46 grains	5 oz. 228 grains	11 oz. 18 grains
0.68	1 oz. 39 grains	5 oz. 193 grains	10 oz. 385 grains
0.67	1 oz. 32 grains	5 oz. 158 grains	10 oz. 315 grains
0.66	1 oz. 25 grains	5 oz. 123 grains	10 oz. 245 grains
0.65	1 oz. 18 grains	5 oz. 88 grains	10 oz. 175 grains
0.64	1 oz. 11 grains	5 oz. 53 grains	10 oz. 105 grains
0.63	1 oz. 4 grains	5 oz. 18 grains	10 oz. 35 grains
0.62	434 grains	4 oz. 420 grains	9 oz. 403 grains
0.61	427 grains	4 oz. 385 grains	9 oz. 333 grains
0.60	420 grains	4 oz. 350 grains	9 oz. 263 grains
0.59	413 grains	4 oz. 315 grains	9 oz. 193 grains
0.58	406 grains	4 oz. 280 grains	9 oz. 123 grains
0.57	399 grains	4 oz. 245 grains	9 oz. 53 grains
0.56	392 grains	4 oz. 210 grains	8 oz. 420 grains
0.55	385 grains	4 oz. 175 grains	8 oz. 350 grains
0.54	378 grains	4 oz. 140 grains	8 oz. 280 grains
0.53	371 grains	4 oz. 105 grains	8 oz. 210 grains
0.52	364 grains	4 oz. 70 grains	8 oz. 140 grains
0.51	357 grains	4 oz. 35 grains	8 oz. 70 grains
0.50	350 grains	4 oz.	8 oz.
0.49	343 grains	3 oz. 403 grains	7 oz. 368 grains
0.48	336 grains	3 oz. 368 grains	7 oz. 298 grains
0.47	329 grains	3 oz. 333 grains	7 oz. 228 grains
0.46	322 grains	3 oz. 298 grains	7 oz. 158 grains
0.45	315 grains	3 oz. 263 grains	7 oz. 88 grains
0.44	308 grains	3 oz. 228 grains	7 oz. 18 grains
0.43	301 grains	3 oz. 193 grains	6 oz. 385 grains
0.42	294 grains	3 oz. 158 grains	6 oz. 315 grains
0.41	287 grains	3 oz. 123 grains	6 oz. 245 grains
0.40	280 grains	3 oz. 88 grains	6 oz. 175 grains
0.39	273 grains	3 oz. 53 grains	6 oz. 105 grains
0.38	266 grains	3 oz. 18 grains	6 oz. 35 grains
0.37	259 grains	2 oz. 420 grains	5 oz. 403 grains
0.36	252 grains	2 oz. 385 grains	5 oz. 333 grains
0.35	245 grains	2 oz. 350 grains	5 oz. 263 grains
0.34	238 grains	2 oz. 315 grains	5 oz. 193 grains
0.33	231 grains	2 oz. 280 grains	5 oz. 123 grains
0.32	224 grains	2 oz. 245 grains	5 oz. 53 grains
0.31	217 grains	2 oz. 210 grains	4 oz. 420 grains
0.30	210 grains	2 oz. 175 grains	4 oz. 350 grains

Per Cent	For 10 Lbs	For 50 Lbs	For 100 Lbs
0.29	203 grains	2 oz. 140 grains	4 oz. 280 grains
0.28	196 grains	2 oz. 105 grains	4 oz. 210 grains
0.27	189 grains	2 oz. 70 grains	4 oz. 140 grains
0.26	182 grains	2 oz. 35 grains	4 oz. 70 grains
0.25	175 grains	2 oz.	4 oz.
0.24	168 grains	1 oz. 403 grains	3 oz. 368 grains
0.23	161 grains	1 oz. 368 grains	3 oz. 298 grains
0.22	154 grains	1 oz. 333 grains	3 oz. 228 grains
0.21	147 grains	1 oz. 298 grains	3 oz. 158 grains
0.20	140 grains	1 oz. 263 grains	3 oz. 88 grains
0.19	133 grains	1 oz. 228 grains	3 oz. 18 grains
0.18	126 grains	1 oz. 193 grains	2 oz. 385 grains
0.17	119 grains	1 oz. 158 grains	2 oz. 315 grains
0.16	112 grains	1 oz. 123 grains	2 oz. 245 grains
0.15	105 grains	1 oz. 88 grains	2 oz. 175 grains
0.14	98 grains	1 oz. 53 grains	2 oz. 105 grains
0.13	91 grains	1 oz. 18 grains	2 oz. 35 grains
0.12	84 grains	420 grains	1 oz. 403 grains
0.11	77 grains	385 grains	1 oz. 333 grains
0.10	70 grains	350 grains	1 oz. 263 grains
0.09	63 grains	315 grains	1 oz. 193 grains
0.08	56 grains	280 grains	1 oz. 123 grains
0.07	49 grains	245 grains	1 oz. 53 grains
0.06	42 grains	210 grains	420 grains
0.05	35 grains	175 grains	350 grains
0.04	28 grains	140 grains	280 grains
0.03	21 grains	105 grains	210 grains
0.02	14 grains	70 grains	140 grains
0.01	7 grains	35 grains	70 grains

In giving these weights, we have confined ourselves entirely to pounds, ounces and grains, leaving out drachms and scruples.

We figure:

1 pound = 16 ounces = 7000 grains
1 ounce = 437.5 grains.